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An Epidemic of Milk-Borne Paratyphoid Fever*

St. Catharines, Ontario, 1931

I. Epidemiological Features

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DURING the first week in July, 1931, reports were received from the Medical Officer of Health of St. Catharines, Ontario, that an outbreak resembling milk typhoid fever was in progress in that city, and assistance was requested in tracing the outbreak to its source. A supply of investigation forms was immediately forwarded, with the request that there should be completed by the public health nurses a record of all the cases reported to the health department. The water supply was known to be adequately protected.

Within a few days, a visit was made to the city by the Provincial Sanitary Engineer and the Provincial Epidemiologist. The histories—some 150 in number—that had been gathered by the nurses at that time were first analyzed. The various possibilities for routes of infection were listed: water, milk, butter, cheese, cream, lettuce salads, celery, ice, ice cream, or common meals, such as banquets, etc. Two factors common to all the cases were the water, which was used by everyone who was ill, and, similarly, milk from one dairy. This dairy supplied approximately 30 per cent of the milk used in the city, but all the cases of paratyphoid fever were on the one milk route. Butter—which was not used by the infants suffering from the disease—came from 21 different sources. Cheese, when used—and fully 50 per cent of the patients did not use it—came from nine different sources. Ice cream, which had been eaten by about 80 per cent of the cases, was obtained from seven different sources. Ice was used by 157 patients and came from six different sources.

The conclusion from this information, therefore, was that the route of infection causing this outbreak was the milk supply from one dairy.

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It is true that all the patients had also used the city water; but city water had been used by all the residents of St. Catharines during this period, and yet the cases of paratyphoid fever had occurred only on this one milk route.

A total of 457 cases was reported from St. Catharines in this epidemic, with three deaths. This gives a case fatality rate of 0.6 per cent, which is extremely low for paratyphoid fever; other epidemics of a similar character are reported as having given between 2 per cent and 4 per cent fatality rates.

Analysis of 400 histories shows the following distribution for sex: males, 193, and females, 207; and for age: 0-4 years, 24 per cent; 5-9 years, 19 per cent; 10-14 years, 14.7 per cent; 15 years and over, 42.3 per cent. Over 57 per cent of the cases were thus in children under 15 years of age, whereas only approximately 33 per cent of the population is in this age group. This distribution is, of course, characteristic of a milk-borne epidemic, the highest percentage of cases occurring amongst the heaviest users of milk, namely, children.

The dates of onset of the cases were most interesting, illustrating the explosive nature of the outbreak. The incubation period of paratyphoid fever has been given as 10-14 days, with limits of 2-24 days. The number of cases with onset from June 22nd to July 7th was as follows:

June 22	2	July 1	63
" 23	5	" 2	41
" 24	2	" 3	24
" 25	10	" 4	14
" 26	13	" 5	18
" 27	23	" 6	9
" 28	29	" 7	10
" 29	52		
" 30	50		

From June 27th to July 5th, 314, or 78.7 per cent of the cases occurred. Secondary cases continued to develop until September of the same year.

On investigating the dairy under suspicion, it was found that none of the workers, with one exception, gave a history of typhoid fever or any similar illness. One man had had typhoid fever fourteen years previous. He was excluded from work, but two specimens of urine and faeces failed to show the presence of typhoid or paratyphoid organisms. The explanation of how the milk was distributed without being properly pasteurized is presented by the Provincial Sanitary Engineer.[1] The date of this occurrence was June 21st.

The eighteen farms which had supplied the raw milk that had not been pasteurized on June 20th,[1] were all visited by the milk inspector; on none of these farms had there occurred a case or suspected case of

[1]A. E. Berry: *Milk Pasteurizing Equipment.* Page 310.

typhoid or paratyphoid fever within the six months' period prior to the epidemic.

One significant fact, however, did stand out. On two of these farms, the practice had been to cool the milk while in the can in a small creek that ran through the area. The can was immersed in a sunken barrel, with the lid slightly ajar to allow the escape of odours. On June 20th there occurred a very severe thunder storm, with a rainfall of 1.01 inches in a few hours. The creek had risen at this time, and it is suggested that the creek water gained entrance to the cans of milk which were being cooled. The analysis of the water in the creek on July 16th showed the presence of B. coli in 10 cc. amounts. A sanitary survey along this creek also showed many points where contamination from privies could gain entrance.

The sequence of events leading up to this epidemic would appear to be as follows:

(1) Milk from several of these 18 farms was probably contaminated on the occasion of the severe thunder storm, when the creek water could have entered the cans being cooled in the creek.

(2) Milk from these 18 farms was mixed on June 21st in one pasteurizer, and, as will be explained,[2] was inadvertently not given the heat treatment, but distributed in the raw state.

(3) The explosive nature of the outbreak, taking into consideration the variable time of individual incubation, would suggest that on one occasion only was the contaminated milk distributed without proper pasteurization.

This is the first recorded outbreak of paratyphoid fever to gain such proportions in Ontario. As a matter of record, the figures from the Central Laboratory of the Department, kindly supplied by Dr. McNabb, reveal the fact that the first two cases of paratyphoid B. infection diagnosed in the Central Laboratories occurred in 1928, when the diagnosis was made by blood cultures. In 1929, no positive blood cultures were obtained, but seven sera showed positive agglutination. In 1930, however, there were received from St. Catharines five sera showing positive agglutination, and two specimens of blood yielding positive culture. This was the highest number from any one municipality during that year, out of a total of twenty giving positive agglutination, and seven giving positive blood culture.

The literature gives numerous instances of paratyphoid fever epidemics. In New Rochelle, N.Y., Williams reports an epidemic of fifty cases found to be spread by infected milk from a certified milk dairy. In this instance, a worker in the dairy was found to be a carrier of B. paratyphosus B. Wade and McDaniel report an epidemic of 106 cases with 2 deaths amongst students at the University of Minnesota. This epidemic was traced to the use of milk in a cafeteria where two of the food handlers were found to be carriers of B. paratyphosus B.

[2] *Milk Pasteurizing Equipment.* Page 310.

From England are reports of epidemics traced to ice cream, cream cheese and raw milk. In these instances, a carrier was identified who had handled the particular food product which caused the outbreak.

This epidemic at St. Catharines is another instance which teaches the necessity of continual vigilance in the care and protection of milk supplies. A series of unlooked for, but avoidable circumstances culminated in this serious epidemic. Pasteurization is an adequate safeguard for public milk supplies, but the process must be thoroughly understood and intelligently applied under proper and strict supervision to give 100 per cent protection at all times.

II. Clinical Aspects

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ON Wednesday, July 1, 1931, seven cases of acute gastro-enteritis, from one household, were reported to the Health Department of St. Catharines. Investigation showed that this family, living just beyond the city limits, had used city facilities in regard to drinking water and sewage disposal; but none of these patients had been away from home for many months previous to the illness.

It is of interest to recount in some detail the history of the members of the family in which the cases were first reported. The first to take ill was Marie, age 4½ years, whose initial symptoms on June 24 were diarrhoea and fever, followed by vomiting. Veronica, age 2½ years, took ill the following day, having practically the same symptoms. On the 28th, Gerald, age 5, had diarrhoea and fever. That same afternoon, Donald, age 10 months, became restless, was put to bed, and shortly afterwards had diarrhoea. All children in the house were ill before any of the adults contracted the disease.

The first adult in the family to take ill was the father, age 30, who was forced to come home from work on June 19 on account of weakness and diarrhoea. Two days later—July 1—the grandmother, age 60, developed symptoms of diarrhoea, extreme weakness, vomiting, abdominal tenderness, with a temperature of 105. On the same day, the mother of the children took ill, complaining of headache, diarrhoea, and pains in the legs and neck.

All the patients were admitted to the isolation wing of the General Hospital in St. Catharines. The symptoms common to this family were extreme weakness, high fever, indefinite pains, vomiting and diarrhoea. All had used city water, but the only food common to all the members of this family was milk, which naturally was under

suspicion as the probable source of infection. It was also noted that those who used most milk were the first to manifest symptoms.

On July 2 several more cases were reported, each of whom had been ill for some days previous. The symptoms most commonly met with were vomiting, headache, abdominal pains and weakness. Diarrhoea did not appear to be of as frequent occurrence in later cases as it was in those of the first family taken ill.

In all epidemics of acute gastro-enteritis, diagnosis may at first present great difficulties, and laboratory findings which require time must be relied upon. Our first impression, especially with only one family involved, was that some irritating substance, possibly in one bottle of milk, was the cause of the symptoms; but, the next day, when several other cases were reported, we realized that we had to do with a general and widespread infection, presumably typhoid or paratyphoid fever.

Typhoid fever is classically a disease of adolescence, with a slow onset, chills, epistaxis and a relatively slow, dicrotic pulse. The spleen is constantly enlarged and rose spots appear about the seventh day. Our cases, with few exceptions, did not conform to this picture. During the investigation, however, two cases were found which were due to Bacillus typhosis, one of whom died of perforation. Both these patients had been working out of town just prior to their illness. Paratyphoid fever so closely resembles typhoid that, at the outset, these diseases are difficult to distinguish. Paratyphoid is spread in the same manner as typhoid and the same procedures are used for its detection and prevention. Laboratory findings alone can differentiate between these diseases.

Dawson has described paratyphoid as "Typhoid fever in miniature." This very aptly gives a picture of the epidemic under study. The onset was abrupt, with a great variability of symptoms. Prostration was the most common symptom, being present in almost all the cases, and on this alone a number of diagnoses were made early in the epidemic. This was especially true of the older patients. Headache was fairly constant, being found in approximately 65 per cent of the cases. Diarrhoea was found in 68 per cent; hemorrhage from the bowel was very rare, and in children, practically unknown. Very few cases showed mucous in the stool. Vomiting was not a very constant symptom, less than 75 per cent showing this, and relatively uncommon in children, who were more prone to constipation than adults. Abdominal tenderness was found in some 60 per cent, while enlarged spleen was found in 25 per cent of all cases. Some patients complained of much soreness in this region. "Rose spots" were present in about 25 per cent of the cases examined, but few showed this rash to as marked a degree as is commonly encountered in typhoid fever. The temperature was typically of a typhoid character, with an abrupt rise and a gradual fall. In few cases was it less than 103, while the highest recorded was

106.8. This patient made an uneventual recovery in 18 days. Epistaxis was rarely met with. Since the date of the distribution of the infected milk was known, it was possible to determine the incubation period, which was from two to twenty-one days, with the average twelve days.

The average duration of illness was twenty-eight days, although one patient died on the fifth day. There was a total of 457 cases, with three deaths, all adults, which gives a death rate of 0.65 per cent. Most authorities give the death rate as 2 to 3 per cent. A great variability in the length of time of the convalescence was noted, some cases becoming symptomless with defervescence, while in others the convalescence was very protracted. There were nine secondary cases.

III. Bacteriological Studies

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THERE were received for investigation at the Central Laboratory of the Provincial Department of Health from St. Catharines during an epidemic of paratyphoid fever, 115 whole blood specimens, 80 faeces and urine specimens.

The whole blood specimens were submitted in 1.2 x 6.5 cm. test tube containers and were subjected to the routine tests, namely, agglutination test of the serum, after separating by centrifugalization, with B. typhosus, B. paratyphosus B, B. paratyphosus A, B. abortus and B. tularense and culture of the clot. The usual technique for macroscopic agglutination was used, the mixtures of antigen and serum dilutions being placed in a water bath at 37° C. for 6 hours and then at room temperature over night. The antigens used were formalized suspensions with a density of two thousand million per cc.

The blood clots were placed in beef infusion and incubated for 24 hours at 37° C. before streaking on Endo's and blood agar plates, after which incubation was continued for a period of at least three weeks when negative results were recorded. Colourless, non-lactose fermenting colonies developing on the Endo plates were transferred to triple sugar slants, which were incubated for 24 hours; transfers were then made to veal broth and broths containing the various carbohydrates for further identification.

The faeces samples were received in the buffered glycerol-saline pH 7.3 distributed as a routine in special containers by the laboratories. Each specimen, on receipt, was streaked to 6 plates—one each of the following media: eosinmethylene-blue, MacConkey's bile salt agar, lactose litmus agar, Endo's, crystal violet agar and blood agar. After

incubation for 24 hours, colourless colonies were fished and carried through the usual tests for identification. MacConkey's bile salt agar has proved the most satisfactory medium in our experience.

TABLE I

ST. CATHARINES EPIDEMIC

Agglutination	Blood Culture	Faeces
No. examined.....115	No. examined.....115	No. examined.....80
No. positive..... 76	No. positive..... 38	No. positive.....25
Per cent positive.....66.0	Per cent positive.....33.04	Per cent positive.....31.25

The results are shown in summary in Table I. Seventy-six positive agglutinations with paratyphosus B. were obtained in 115 specimens—thirty-eight strains of paratyphosus B. were cultured from the same 115 specimens of blood and 25 strains were cultured from 80 specimens of faeces. Of very definite significance is the fact that 16 strains were isolated from whole blood specimens the sera of which failed to show agglutination. As these were taken from early cases, before agglutinins had developed, the importance of submitting whole bloods for investigation, rather than dried blood or serum only, is evident.

The agglutining titres of the 76 positive sera are shown in Table II.

TABLE II

ST. CATHARINES EPIDEMIC

Bloods examined gave agglutination reactions in the following dilutions:

1:40 partial	1:40	1:80	1:160	1:320	1:640 and higher
19	4	8	7	15	23

The strains isolated from the epidemic conformed culturally and seriologically, including absorption of agglutinin, with a known strain of B. paratyphosus B. The thermal death point of these strains has been tested. 0.5 cc. of a 24-hour broth culture was added to tubes containing 10 cc. of sterile milk. These tubes were exposed to various temperatures for a varying length of time, cooled, then incubated for 48 hours and plates made from each tube. The strains tested did not survive 140 F. for 15 minutes' exposure, nor 149° F. for 5 minutes' exposure.

A 24-hour broth culture was added to one quart of sterilized cream. The cream was divided into two portions. One portion was churned while still sweet and the second allowed to sour before churning. Each sample was churned, the butter washed, 0.5 per cent sodium chloride added, and stored in the ice-box. Twenty-five days after manufacture, B. paratyphosus B. was isolated from each lot. The cultures were pathogenic for laboratory animals.

Summary of Bacteriological Findings

Strains of an organism indistinguishable from B. paratyphosus B. were isolated from the St. Catharines epidemic. Thirty-eight of these strains were isolated from blood cultures and 25 from faeces and urine specimens. Sixteen of the whole blood samples submitted for agglutination test from patients in the early stage of the disease gave negative agglutination reactions, but cultures made from the blood clots yielded 16 strains of B. paratyphosus B. The strains isolated failed to survive 140° F. for 5 minutes' exposure. These strains have been found to remain viable and pathogenic in butter for at least 25 days after churning.

IV. Milk Pasteurizing Equipment

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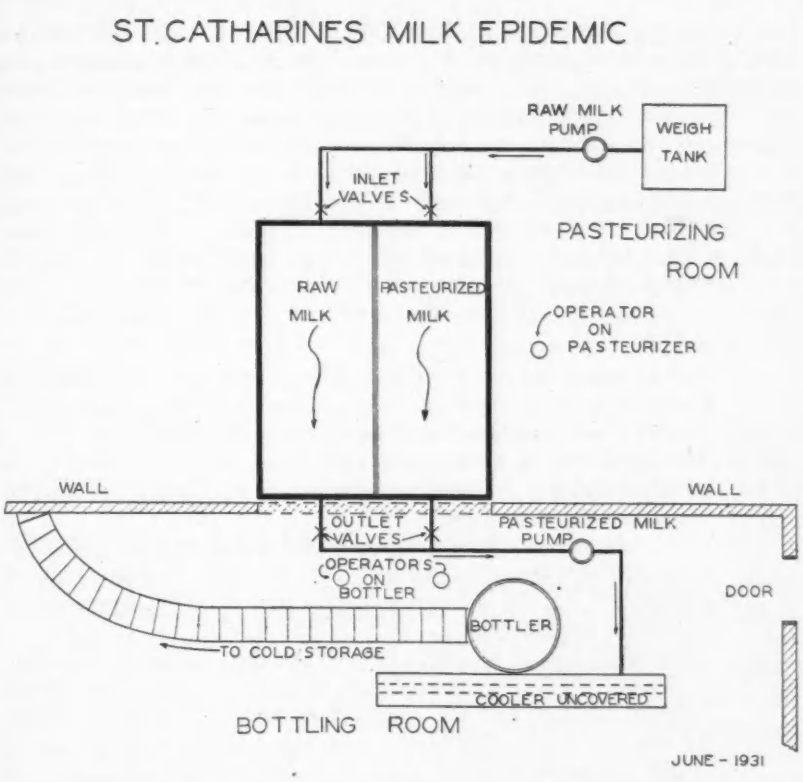
THE milk-borne epidemic at St. Catharines in June, 1931, was characterized by a number of unusual features. It was the first major epidemic of its kind and origin reported in Canada. It was responsible for a large number of cases (457) and it was confined to one dairy. In spite of the high morbidity, only three deaths occurred. Investigation into the cause of the outbreak was complicated, and revealed a most unexpected set of circumstances. A detailed study of the various factors concerned with the epidemic brought to light data of epidemiological and milk control value; it likewise furnished valuable information for the prevention of similar occurrences in future.

The epidemiological study of the very early cases cast suspicion on one dairy. As further cases were reported and investigated, this dairy became involved to the point where all reasonable doubt as to the distributor of the infection had disappeared. The focus of the infection being established, it was necessary to determine its origin and the part the dairy played in permitting it to reach the milk consumers. This phase of the investigation was made more difficult by the interval between the time of the infection and the investigation. Many of the details which had an important bearing on the cause were forgotten by those working at the milk plant.

Approximately 93 per cent of the entire milk supply of St. Catharines was at that time supplied by five main dairies. The dairy in question may, for the purpose of this communication, be designated as dairy "A." It was one of the newest plants. The old equipment had been replaced by new pasteurizing units less than two months prior to the epidemic.

The routing of the milk in dairy "A" was as follows. It was



dumped from the eight gallon cans into a weigh tank, and from here was pumped to the pasteurizing plant. This was a twin unit in which two pasteurizing tanks were built side by side. The volume of milk handled by the plant made it necessary to fill each of these tanks a number of times each day. The routine carried out was to pasteurize one tank-full of milk; and, while this was being pumped to the cooler, the other side was being filled and pasteurized. Both pasteurizing vats were connected to a common outlet. This outlet pipe led to a pump, which, in turn, delivered the milk to an open surface cooler, from which it passed by gravity to a mechanical bottler and capper. The last stage of the process was the crating of the bottles and delivery to the cold storage room.

The operations in this plant were normally carried on by three men, each having a specific duty to perform. One was in charge of pasteurization. He pumped the raw milk into the pasteurizing vats, heated it, and advised the others when the process was completed. The other two men were employed on the bottler. It was their function to pump the milk from the pasteurizer to the cooler, to examine the capped

bottles, and to place them in the crates ready for storage. These two latter operators were somewhat isolated from the man in charge of the pasteurizers in that they worked in separate rooms. Only the outlet end of the pasteurizer protruded through the wall dividing the rooms. It was customary for the man working on the pasteurizers to call to the others when a vat of milk was ready for delivery to the bottler. The pump on the processed milk could not be operated at a uniform rate, and it was necessary for one of the men to open and close the outlet valve on the pasteurizer to regulate the flow of milk to the cooler.

A detailed examination of this dairy plant made at the time of the epidemic brought to light many important defects. Some of these were as follows:

(1) The layout of the plant was faulty. The rooms were so divided that the entire process was not easily controlled. There was a tendency for mistakes to be made in the process.

(2) The inlet valves on the raw milk line were improperly constructed and any leakage past these might permit some milk to be incompletely processed.

(3) The outlet valves were not suitable for the purpose intended. They did not leak when closed with pressure, but there was a tendency for these to remain partly closed; they were neither leakproof nor flushproof.

(4) The piping layout was defective. The use of a common outlet pipe from the two vats made an undesirable cross-connection between the raw and the pasteurized milk. Any leakage from the raw milk valve—and there was every reason to expect this—would contaminate the treated product. The danger was further augmented by the possibility of the operator's opening the wrong valve.

(5) The milk cooler was uncovered and lent itself to surface contamination. A number of other defects of a minor nature were also found.

How Infection was Spread

The data accumulated in the investigation pointed to the following route as that by which the infection reached the milk consumers:

The raw milk was contaminated with paratyphoid organisms, believed to have been introduced at the producer's farms. The extremely hot weather at that time permitted a very great increase in the infection during transportation. As the milk reached the dairy on June 21st, the pasteurizing process was started in the usual way. One vat had been treated and was ready for cooling. The other was filled with raw milk, the temperature of which was being raised to the pasteurizing range. The information secured from the plant and corroborated by the findings was to the effect that one of the operators

on the bottling machinery opened the wrong outlet valve, and thus permitted raw milk to reach the cooler. This was pumped for some time, until the pasteurizer attendant noticed the mistake. This raw milk, no doubt, contaminated the cooling and bottling machinery and spread the infection to all the milk bottled subsequent to that time. No attempt was made to repasteurize this raw milk which had escaped. The outbreak made a sudden appearance after the date on which this took place. The arrangement of the plant was such that mistakes of this kind could be easily made. All the data surrounding the outbreak were so closely related to this mistake that no reasonable doubt as to the cause remained. Infected raw milk had passed through the plant without being pasteurized. Doubt must remain as to whether this infection was on one day only, or whether it was spread over a longer period, due to leaking valves. The fact that one of the men on the bottling machine gave a history of typhoid fever some years previously was regarded as suspiciously significant, until the results of his examination were negative.

Protection against Similar Epidemics

All epidemics of this kind teach useful lessons; they should serve as a warning against similar catastrophes. The most important lesson to be deduced from this epidemic is that milk plants and pasteurizing equipment need supervision. No equipment should be installed which will permit mistakes to be made so easily by an operator. The piping valves and other machinery should be satisfactory for the work expected of them. It is entirely inadequate to pass milk through equipment which is not so designed and installed that it will destroy all pathogenic organisms originally present, as well as prevent subsequent contamination before it reaches the consumer. Equipment is now available which can easily overcome such difficulties as were encountered at this plant. All such installations should conform with specifications designed to ensure these results.

Appreciation is extended to Dr. Currey, the Medical Officer of Health; the Local Board and the Milk Inspector for the excellent co-operation received in this investigation. The local officials spared no efforts to secure all necessary information, and to co-operate with the Provincial Department of Health in every possible way. Only through such co-operation was it possible to carry out this investigation with any degree of adequacy.

Modern Public Health*

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FIFTY or sixty years ago, our knowledge of sanitation and preventive medicine was very limited. As a matter of fact, we knew little or nothing about bacteria, their origin, habitat, reservoir of infection, or distribution. At that time, Public Health was more concerned with the environment of man, and in that sought the source of infection; at present we are more concerned with the individual and find the source of infection in man himself. On looking over the notes I took during the winter session of 1876-77, I find that the lecturer on Sanitary Science told us that, should we have an epidemic of smallpox, our first duty was to have all the out-houses whitewashed, all garbage removed, and the puddles on the streets and lanes filled. It is easily seen, therefore, why public health experts of that day failed to find the source of infection, as well as, in most instances, the routes of transmission. It is true that, at that time, the public water supply was under suspicion, but milk was not suspected until about twenty-five years ago. Flies were not seriously considered until about 1887, during the Spanish-American War, while the mouth-sprays, nose and mouth secretions and the hands have only recently been recognized as important means of spreading disease. Dirty clothes, bad smells, damp cellars, leaky plumbing, foul air, rotten vegetables, stagnant pools, smoke, manure, dead animals—in fact, everything that was unsightly or that had an offensive odor was condemned as unsanitary and, without much discrimination, was regarded as a cause of disease, to be condemned, when found, for fear of producing epidemics.

The old teachers taught that communicable disease originated in foul, ill-smelling, poorly ventilated, dark, sunless hovels of the slums. When any communicable disease, such as smallpox, scarlet fever, typhoid fever and diphtheria, attacked the slum-dwellers, it was considered to be due to the unsanitary environment; if diphtheria invaded the home of the well-to-do, a pin-hole leak in some plumbing fixture was demonstrated as the cause; a rotten potato left in the cellar was the cause of typhoid; scarlet fever was traced to a letter bearing the scales of a deceased friend who had died several months before; smallpox, to unpacked books used by a patient a quarter of a century before; manure piles gave rise to cholera; yellow fever originated in impure water, and bubonic plague was banished from Cairo by improving the ventilation of the city.

The New Public Health is not worrying about elaborate theoretical

**Abstract of the Presidential Address given at the 18th Annual Meeting, Ontario Health Officers' Association, Toronto, May, 1932.*

possibilities, but concerns itself with what really occurs. Communicable diseases are communicable because they are due to the growth, in or on the body, of minute animal or vegetable organisms. The transmissibility of these organisms from person to person explains why the diseases are "catching." When these germs develop in the human body, they leave it through discharges by certain routes; namely, nose and mouth, bladder, and bowel—although in some cases the skin may act as a route. In general, the discharge infects another person only when that person receives the discharge in some form or other in the mouth or nose, with the exception of trachoma and venereal diseases. Outside of the body, disease germs do not, as a rule, live long or multiply, except in milk, water, and other food and drink.

The old style sanitary inspector was considered very negligent if he did not condemn everything from the garbage pail in the backyard to the plumbing in the bathroom. The disease continued because he was condemning, as a rule, so far as health was concerned, irrelevant material. What good purpose did it serve emptying the garbage pail every day or placing a vent pipe on the bath water waste trap, if the milkman was permitted to deliver at the back door milk infected with the causative organism of scarlet fever, or an unrecognized case of measles was allowed to sit in the schoolroom? The New Public Health sees in the garbage pail merely a place where flies are fed and possibly bred, but flies cannot carry infection if infected material or discharges are not accessible to them. The old school regarded the garbage pail in itself and by itself inherently bad, disease-producing and potentially dangerous to health, notwithstanding the fact that the employees in garbage collection and garbage destruction are as healthy a body of men as any engaged in other occupations.

Defective plumbing has been shown to have nothing to do with disease generation or disease propagation unless there be actual leakage of infected sewage, with contamination thereby. The employees connected with large sewage systems are equally as healthy as those employed in garbage collection and disposal.

Unventilated dwelling houses in themselves will not produce tuberculosis or diphtheria. To this day, stagnant water is often considered responsible for typhoid fever, despite the established fact that Bacillus typhosus is the cause of typhoid fever and that no water, however stagnant, can produce the disease, unless it contains this organism.

Modern Public Health is concerned with dirty backyards and damp cellars only as they may be factors in the transmission of infected discharges. Public health now is concerned with the individual as a source of infection, the route by which the infection leaves the individual and the means by which it reaches the mouth of the next individual. To detect all the infected persons and restrict them so as to prevent the transfer of their infected discharges to others, would

control infectious disease and might be the ultimate goal of preventive measures, but, as all sources cannot be recognized, much less controlled, it is well to guard also the routes which unknown infection may take.

As an illustration of the difficulty that we sometimes have to contend with in locating the source of infection, let me direct your attention to a case in point.

In the early part of the month of May, 1931, in one of the chain stores in the city, five of the female employees became ill one Saturday night. My attention was drawn to this occurrence by one of the local doctors about a week or ten days later. I visited the five employees and had their physicians submit samples of whole blood from three of them; the other two suffered from slight illnesses incident to their sex. The report of the laboratory indicated paratyphoid fever. I also visited the premises and found a very unsanitary wood floor, obsolete plumbing, a common drinking mug and an unsightly and unsanitary roller towel. The only foods sold were pineapples, bananas, oranges, grape-fruits and lemons, and these were sold on Saturdays only.

The first probable source of infection I investigated was the water; a sample taken from the tap was sent to the laboratory and was reported "A" quality. Milk supplied to these three girls came from three different dairies; milk and cream sold in Galt were and are all pasteurized. There were no other cases in the city. As to flies, there were none.

I had a rat and a mouse caught to see if, by any possibility, they had infected the food. The rat was negative. The mouse showed infection from salmonella pestiffera. The only source left was a contact one, but who was the carrier? On closer enquiry and examination, I found that one of the three sick girls showed a fever of 102° F. for forty-eight hours only, the temperature remaining normal after that. She came from a neighbouring city and had not been well for some time. Employment in the store had begun three weeks previously. Blood, faeces and urine showed the presence of Bacillus paratyphosus which persisted in the faeces for nearly three months. The final decision, therefore, was that she was the source of infection. The benefits derived from the investigation were a new cement floor, plastered walls, installation of new plumbing, a self-adjusting bubbling drinking fountain, and individual sanitary towels.

Has environment anything to do with infectious diseases? It may permit or facilitate the transfer of human excreta in ordinary life and thus contribute very materially to the spread of disease. Consider, for instance, overcrowding. If there should be a lack of facilities for washing, especially for the hands, it would undoubtedly contribute to the spread of infectious diseases if infection were introduced into the community. The closer association in conditions of overcrowding

facilitates the transfer of mouth and nose secretions and is thus a direct factor in the spread of all respiratory infections.

It is possible that environment may be of such a character as to depress the human vitality, thereby making the individual more liable to develop infectious diseases, but most authorities agree that evidence on this point is very slight, except possibly in regard to tuberculosis and pneumonia. It is very doubtful if overcrowding and poor ventilation will reduce one's resistance to infection, but extremes of temperature, fatigue, alcohol, starvation, etc., alone or together, may increase one's susceptibility.

One thing is absolutely established; namely, that tuberculosis and pneumonia and other infectious diseases will develop under almost any circumstances if the infecting dose is sufficiently prolonged, sufficiently virulent or repeated sufficiently often; but they will not develop, under any circumstances, without such infection. That being the case, how important it is that we should concentrate on the prevention of the spread of these causative agents from the sources.

In many municipalities, the general public in the past looked on the Public Health vocation as an extraordinary profession, interested in cutting weeds, burying dead animals, suppressing nasty odors, inspecting plumbing and supervising the collection of garbage. Even at the present time, according to quite a number of individuals, this opinion still prevails about a good health officer; his duty as medical officer of health is to see that the streets are clean, the lanes neat, the houses free from bed-bugs, and the cellars free from garbage and other debris.

I am satisfied, however, that the time has arrived when the majority of the thinking public demand and expect up-to-date action on the part of the health department and from now on will insist on thinking, acting, and legislating for the future, instead of the past and the present.

If attention is sufficiently directed to the infected person and the discharges, the general surroundings may, in most circumstances, be ignored and the disinfection of the premises occupied by the infected person may also be abandoned (except in tuberculosis, where it is possibly of practical benefit, if the premises are to be occupied within a month). Sputum may be conveyed through direct contact; other micro-organisms by the bowels and bladder and hand. If the hands are one of the chief means of spreading infection, how important it is that we should take every precaution to prevent the hands from spreading the infection through handling food, water, eating utensils, towels, etc., in order to prevent the infected matter from reaching the mouth of the susceptible new host.

Serum Therapy in Acute Poliomyelitis

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IN the northern hemisphere the season for poliomyelitis is approaching. No new method of therapy has been introduced. The reactions following injections of sera prepared by inoculation of horses with the virus of poliomyelitis, render treatment by this method at present inadvisable. Human immune serum remains the only specific therapy suggested. Netter[1], who introduced the therapy in 1911 was optimistic. In the 1916 epidemic in America, the results were inconclusive, but a small series of cases treated by Amoss and Chesney[2] gave promising results. In 1924-1925, in New Zealand, Robertson[3] and his co-workers were convinced of the value of serum when administered to cases in the preparalytic stage in large doses by the intrathecal and intravenous methods. Reports from the United States of America[4], and from Canada[5] up to 1930, expressed the conclusions as reported by Aycock in 1929[6], that the use of serum was beneficial, as evidenced by a low mortality rate, a low average total paralysis, and a strikingly low proportion of paralysis of the severer grades. It was soon realized that analysis of records of cases for assessment of the value of serum by the evidence of statistics, presented many difficulties, the greatest being the uncertainty of the prognosis of untreated cases.

Since the epidemic of 1931 in America, Kramer, Aycock, Solomon and Thenebe, have published a report[7] of a series of cases, and Park[8] has reported, but not yet published details of another series of patients diagnosed before paralysis. In both instances, some patients were treated with serum, others left without; though it is not recorded that a strictly alternate selection of cases was followed. The conclusions of the former workers agreed with those of Park: that they failed to obtain statistical evidence that the serum used was effective. However, it was not possible to draw the reverse conclusion, namely, that the serum used was of no value. Both groups of workers agreed that, while no conclusions could be drawn as to the efficacy of convalescent serum, the outcome of these studies justified the continuation of its use.

The publication of this work, however, has caused, in some circles, a reaction in medical opinion, more extreme than is warranted by the considered statements published—an attitude of hopelessness and a questioning of the basic fact as to whether human immune serum has any value at all in the treatment of poliomyelitis. It would appear, therefore, an opportune time to consider some of the difficulties in the compilation of statistical evidence, and to question whether conclusions deduced from the results obtained in any series, when the serum used has been prepared by a certain method and used by a certain method, can or should be expanded to question the value of the therapy in general. May not the solution be that modifications of the method of preparation and of administration may be followed by different results?

The basis for the therapy lies in the experimental work of Flexner and Lewis[9], Landsteiner and Levaditi[10], which proved that serum prepared from the blood of human or monkey who had survived an attack of poliomyelitis has the power to inactivate *in vitro* an effective dose of virus. It is well to remember two other conclusions of experimental work. Flexner and Amoss[11] in 1916 showed that, in monkeys receiving poliomyelitis virus intravenously, intranasally, or subcutaneously, the introduction of normal (non-immune) serum into the spinal theca will promote the infection of the nervous system.

As the condition of such monkeys is closely analagous to that of patients in the preparalytic stage of poliomyelitis, it would appear important that nothing but actively immune serum be introduced into the theca. Therein this therapy differs from others, in which the administration of an inactive serum is not likely to cause actual harm.

As shown by Schultz,[12] the time taken for immune serum to inactivate the virus varies directly with the dilution of that serum.

THE SERUM

Selection of Donors

When appeals for blood are published in the press, many persons who believe their crippling to be due to infantile paralysis, volunteer or their names are obtained by some organization. In Victoria, Australia, in 1925, when the search for donors was commenced, 15 per cent of the names obtained from various sources as cases of poliomyelitis had to be discarded because the clinical examination, undertaken to confirm the diagnosis, showed that the crippling was due to other causes—talipes, spastic paralysis, etc. Secondly, the doctor responsible for the potency of the serum risks a great deal if he accepts, as donors, persons who have had serum therapy themselves and who have escaped paralysis. It is probable that a proportion of such persons, though treated in the preparalytic stage, has had the opportunity to acquire an active immunity; but unless the serum of each individual can be tested and proven capable of inactivating virus, this group of volunteers should be discarded. Moreover, in communities where confirmation of a clinical diagnosis by cerebro-spinal fluid examination has not been made a condition for serum administration, it is possible that some cases of illness due to other causes, are diagnosed and notified as cases of poliomyelitis, and some of these later may volunteer as donors. As the inclusion of serum from one non-immune individual may lower the potency of a batch of serum by ten to twenty per cent, it is a safer policy to exclude any volunteer who has not proof of his previous infection, and therefore of his opportunity to acquire immunity, as evidenced by demontrable residual paralysis.

The question arises, how long from the original attack does the serum of the survivor retain its potency? Experimental work has indicated that this property remains for many years. The difficulties of accurately titrating serum, by estimating the power of various amounts to inactivate a standard amount of virus, make it almost impossible to measure the quantitative depreciation in viricidal power of the serum of donors, years after the attack. Immunity induced by vaccinia, a disease caused by a similar filter-passing virus, depreciates with elapse of years and it is, therefore, justifiable to infer that donors of poliomyelitis serum bled within the first five years of their disease will furnish serum more active than will those persons bled after an interval of fifteen to twenty years.

Some incomplete experimental work done in Australia by Burnet and Macnamara[13], has suggested the presence of immunological differences between an American strain, obtained through the courtesy of Dr. Flexner, and a strain isolated in Australia, monkeys possessing a solid immunity to one strain being paralysed after inoculation of the other. Though as yet unconfirmed, this work suggests the wisdom of testing the potency of serum, prepared for use in any epidemic, against a virus isolated as recently as practicable, rather than against a virus obtained from a patient who died ten or twelve years before.

The Preparation

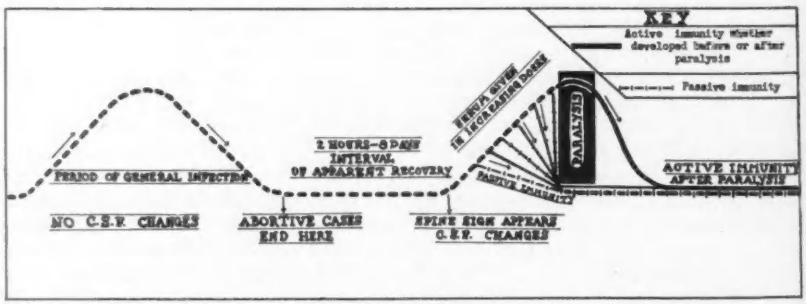
The method of preparation in general use in America has been as follows:

The blood is taken, with aseptic precautions, into a sterile vessel and allowed to clot naturally. The serum is separated, filtered, tested for sterility and the Wassermann reaction. Antiseptic is added and the serum is stored in ampoules until used. In Australia, a different method has been used in four states—Victoria, Tasmania, South Australia and Queensland. The method, which was developed by Morgan in 1925, has been described in detail in a previous report.[14] The essential differences from the American method are: (1) the use of potassium oxalate as an anti-coagulant, and after separation of the plasma from the red cells, the induction of clotting by the addition of calcium chloride; and (2) the absence of added antiseptic. The reason for the development of this method was the desire to avoid any reaction following intravenous and intrathecal administration of serum—reactions such as had been described in the earlier literature where the products, injected intrathecally, had, in some cases, haemolysis; in others, excess of lipoid substances, and added antiseptic. It is suggested that the use of the oxalate method tends to lessen the degree of haemolysis which occurs when the vessels containing the blood have to be conveyed from a distance, and that the clotting induced by the addition of calcium chloride may be made more complete than that which occurs when blood is allowed to clot naturally. More work is needed to determine the relative importance of the influence of haemolysis, incomplete clotting, added antiseptic, on the production of reactions after intrathecal injections, and also the effect of antiseptic on the potency of stored serum.

The disadvantage of the method used in Australia is the responsibility for perfect asepsis, which is placed upon the persons withdrawing the blood and preparing the serum. This may not be altogether a disadvantage, for, in order to give added protection, it has been a policy in these States to keep the serum at ice-box temperature, even during transportation. Thus the policy, devised as a safeguard, may have lessened the deterioration from exposure to heat. Serum prepared by this method, kept at ice-box temperature, has been tested for potency three and a half years after its preparation, with no detectable depreciation.[15]

SELECTION OF CASES

Every untreated case of poliomyelitis who survives goes through an initial stage of illness and develops active immunity. This may occur early, before the spine sign has developed, or later, after its development, but before death of nerve cells has occurred; or the development of active immunity may be postponed until the person has sustained varying degrees of damage to the cells of the cord. By the administration of a serum containing viricidal properties of as high a titre as possible, we are trying to confer a temporary passive immunity; to cut short the disease between the development of the spine sign and the stage, a little later, when the nerve cells have died. This conception may be illustrated more clearly by modifying Draper's diagram[16], to picture the effect desired by serum in diverting cases from proceeding through paralysis.



Untreated, some cases take the course of the heavy black line, through the stage of paralysis. Others miss this stage, as shown by the fine black line. The aim of treatment is to divert all cases to the course of the broken line.

Experience in teaching students and post graduates the handling of these cases has impressed upon us the fact that unless the doctor examining the case has accurate knowledge of muscle function, and unless he tests the function of each muscle group against gravity and against resistance, he is liable to label as preparalytic, cases who already have some degree of paralysis. Frequently, in poliomyelitis, a child is able to move his limbs in bed, but, when tested for weight bearing, the lower limb cannot hold the body weight in a normal way. The knee tends to hyperextend; the hip is unstable, or the foot may invert or evert; while in the upper limb, the deltoid muscles may be strong enough to abduct the limb while the patient is recumbent, but cannot do so when he is erect.

In analysing any series of cases, reported as treated in the preparalytic stage, the thoroughness of the detail with which this preliminary muscle examination is undertaken, must weigh considerably in assessing the value of the evidence presented. In such series, the degree and extent of paralysis existing weeks later are usually assessed by experts. It is obviously logical that the same expert examination should be undertaken before serum is administered, if such patients are to be included in series labelled "cases treated in the preparalytic stage."

Which cases should be selected for serum therapy? Those in the very early stage, displaying only general symptoms common to many diseases, may develop immunity for themselves without progressing to the stage of the spine sign. At this early stage, the confirmation of the diagnosis by means of changes in the cerebro-spinal fluid is not available. If serum be given to all such patients, a proportion will be wasted upon persons suffering from other diseases. If supplies of serum available are so large that there is no necessity to conserve stocks, in order to have adequate doses available for proven cases at a later, more urgent stage, then it may be considered a safe policy to administer serum to these early, unproven cases. In Victoria, Australia, a different policy had to be adopted, because the serum stocks were limited by the funds available for their collection. There, every patient suffering from an illness for which a definite cause could not be found by careful clinical examination, even though a contact with a case of poliomyelitis, was carefully watched and frequently re-examined, in order to detect the first development of the spine sign, when the cerebro-spinal fluid findings confirmed the diagnosis. Many of the suspect cases settled down without the development of any further signs. For another group, a different diagnosis was established; while a third group, while under observation progressed to definite signs of the later preparalytic stage. Serum was administered, after examination of the cerebro-spinal fluid, and paralysis did not develop.

At the other end of the picture are the patients who have traversed the preparalytic stage, developed paralysis, and acquired an active immunity for themselves. It is wasteful to give these people serum, when the temperature has fallen and the fight is over.

In between are the cases in the preparalytic stage with a positive spine sign and, perhaps, with evidence of commencing damage to the cord, as shown by tremor, hyperaesthesia, retention or photophobia. These are the cases which call for serum therapy. The clinical diagnosis can be confirmed at this stage by examination of the fluid. The estimation of the cell count, of the globulin and the chloride content can be carried out readily at the bedside. If the findings confirm the diagnosis, fluid may be allowed to escape and a slightly smaller quantity of warmed serum slowly introduced into the theca. Thus the patient may be saved a second lumbar puncture if the intrathecal method of administration has been one of the routes selected.

Method of Administration

Much difference of opinion exists as to the best method of administration of serum, whether intramuscularly, intravenously or intrathecally, or any combination of these methods. Following the example of New Zealand, the method selected for use in Australia has been an initial intrathecal and intravenous injection. We do not know, as yet, whether this method possesses any advantage over that of intravenous inoculation only. It is possible that the value of serum injected intrathecally may lie in the alteration of the haematoencephalic barrier, just as the administration of normal serum intrathecally, following intravenous administration of arsenicals, has been used in the treatment of meningo-vascular syphilis. We know that the pia arachnoid shares in the inflammation of poliomyelitis. Serum given intrathecally may influence virus in that locality when blocking of small blood vessels, by the aggregation of small round cells around their walls, may prevent the conveyance of serum administered by an intravenous route. From the reports of cases treated at Winnipeg[5], Toronto[17], Ottawa[18] and San Francisco, California[19], it is apparent that intramuscular injection of the serum available for use at these centres was successful, when given early in the preparalytic stage, but doubts have been expressed by workers in Toronto and Montreal of the possibility of preventing paralysis by this method when the cases have progressed further to the symptom of the spine sign of many hours' duration; together with the presence of tremor or hyperaesthesia. Here more heroic treatment is demanded. While serum is being absorbed over a period of hours from an intramuscular injection, the nerve cells may be dying. As the patient's future may depend uopn the race between the development of a passive immunity and the death of the cells, it is wise to administer serum intravenously. For this reason, also, the product should possess as high a titre as possible. A weaker serum will take longer to combine with the virus, and that extra time required may be too long to avert paralysis. The experience in Victoria impressed upon us the value of an adequate initial dose of serum. In estimating the dose, many factors have to be taken into consideration. First, the potency of the serum available—whether prepared from donors affected many years before, whether the serum is old or recently prepared, whether it may have deteriorated through exposure to heat.

Second is the stage of the epidemic. As the epidemic works up to its fastigium, cases tend to develop more rapidly than in the early days or after the peak has passed. The third group of considerations is derived from study of the patient himself: his history, his age and weight, the degree of toxaemia, the duration of his illness, the rapidity with which the illness has progressed through the stage of general symptoms to special warning signs. The type of cell found in the cerebro-spinal fluid may help in guessing the dose. When almost all the cells are lymphocytes, when globulin is definitely increased, paralysis is near. A patient in whom a history is obtained of illness, six to three days previously, followed by an interval of apparent recovery, lasting for two to three days, followed by the second phase of his illness with pain in the neck and back, fever and the spine sign lasting over twenty-four hours, has little time to lose. The development of tremor, hyperaesthesia, suggests that already some involvement of motor cells and sensory ganglia has occurred. These symptoms call for a larger dose than that which should be needed by a patient who has developed a spine sign within the past six hours, after two days under observation for indefinite illness. The largest doses are required by the patients in whom general symptoms of short duration, twelve to twenty-four hours, are followed by spine sign and, a few hours later, perhaps, by tremor. These approximate to the fulminating type of case described in the older text-books, and demand

proportionately larger doses than those in which the progress of the disease is more leisurely. Unfortunately, we have no test to determine whether the dose given has been sufficient to induce a passive immunity. In some respects, the treatment of a case of preparalytic poliomyelitis resembles the treatment of cases of diabetic coma in children, in the early days of insulin, before that product was standardized, but there is no guiding evidence comparable to that furnished by the blood sugar estimation in diabetes. The only guide available as to the skill with which the doctor has measured his weapon, serum, against the virus, is the patient's general condition. If the therapy has been able to short-circuit the disease by conferring a passive immunity, though spinal rigidity will persist, the temperature should fall to normal within eighteen to twenty-four hours and the general condition should be greatly improved, if other confusing factors be eliminated. These cases are frequently slightly acidotic, dehydrated and constipated, due to the fact that the pain in the neck has prevented adequate ingestion of fluid. To clear the picture and eliminate the confusion in the syndrome, due to these factors, it is wise to give after the serum, an aperient, free fluids and carbohydrates by means of a spoon or bent glass tube or feeding cup, thus saving the patient the discomfort of flexion of the neck.

The failures in the cases treated in Victoria have impressed upon us the importance of examinations, twelve, eighteen and twenty-four hours after the first, and have influenced us in omitting antiseptic from the serum, and in the choice of the method of preparation previously outlined. If, twelve to eighteen hours after injection of a product provoking a reaction, the temperature is elevated, the patient still vomiting, one cannot estimate how much to attribute to the reaction and how much is due to insufficient dosage. In Victoria, experience taught us that if the patient had not improved within twenty hours, there was one reason only: insufficient dosage. Observation should be continued, in case a rise of temperature indicates the necessity for a third injection, but this should rarely arise if the first two doses have been guessed accurately. It has been my privilege, from 1925 to 1931, to work in Victoria at the problems presented by the serum therapy of poliomyelitis, and to help in their earlier difficulties the organizations responsible in Tasmania New South Wales and South Australia. In Victoria, each year from the summer of 1927-1928, epidemics occurred of 100 to 200 cases—numbers not overwhelming, allowing the dosage to be uninfluenced by shortage of supplies for proven cases, and allowing time for individual observation and treatment. The records of the work have been published in full.[14] In the six-year period, 133 cases were treated in the preparalytic stage. The method used in the majority was an intrathecal and intravenous injection, with a second intravenous injection twelve to twenty-four hours later, if the clinical condition indicated the need. The largest initial dose given was 110 cc. Of the 133 cases, 7 were failures, developing definite paralysis. Four of these shared one common feature in their history; namely, delay between withdrawal of a large quantity of cerebro-spinal fluid and the administration of serum. With one exception, they were the only cases of the series in which this delay occurred. It is suggested that their failure may be due to one or both of two factors: (1) delay, elapse of hours between withdrawal of fluid and administration of serum; and (2) that the actual withdrawal of fluid during the preparalytic stage may have helped to determine involvement of the cord. Because of the warning from experimental work, that lumbar puncture, especially if accompanied by slight haemorrhage into the theca, may lessen the meningo-choroidal defence, and because of the severe paralysis which followed the deviation from the usual procedure in these four cases, it has been made a routine procedure that examination of the fluid should be done

at the bedside. Another failure, a child of two, on the fourth day of her illness, was given 30 cc. intramuscularly. No further dose was given, although her temperature did not fall, nor her general condition improve. Here paralysis confirmed the lesson taught by a small series of cases, treated in Tasmania with Victorian serum, that 30 cc. of that serum by an intramuscular route, is an inadequate dose when the disease has been progressing for some days. The charts (Diagrams IIa and IIb) of the two remaining cases who developed paralysis, though serum had been given, explain the reason for their failure when compared with the usual chart which occurs after adequate dosage, as shown in Diagrams IIc and IId (reprinted from *The Lancet*, Vol. CCXXII, February 27, and March 5, 1932).

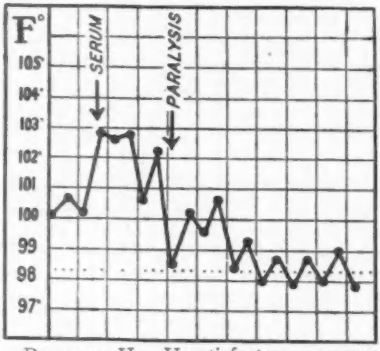


DIAGRAM IIa. Unsatisfactory response to serum. No second injection was given. Serious paralysis developed.

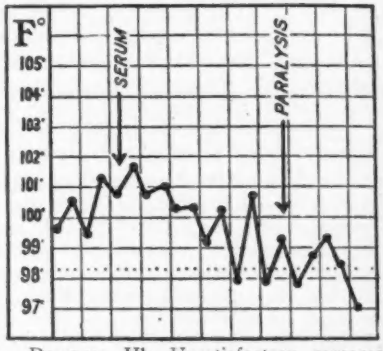


DIAGRAM IIb. Unsatisfactory response to serum. No second dose was given. Paralysis developed.

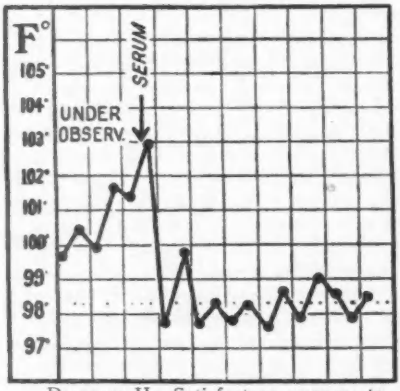


DIAGRAM IIc. Satisfactory response to injection of serum.

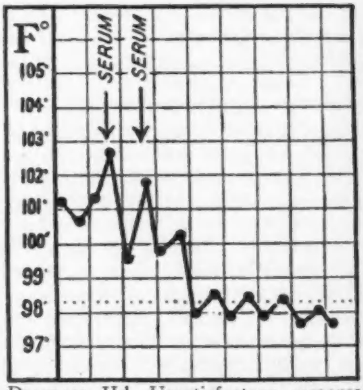


DIAGRAM IId. Unsatisfactory response to first injection. Second dose was required and given. Response was satisfactory.

The study of the cause of failure was the most instructive part of the work, and we considered that these failures did not condemn the therapy which was apparently effective in the remaining 126 cases; but rather was due to poor tactics, to lack of appreciation of the situation, and remission of watchfulness

on the part of those of us responsible. If attempts be made to assess the value of serum therapy by statistical evidence, the selection of cases should be rigidly alternate. If some cases are treated with serum, others without, it is only human to treat the severe cases and leave the milder as controls. If the demand for statistical proof is to be the method of approach, it should be remembered that many variable factors enter into the comparison. Some of these are summarized herewith.

VARIABLES

I. The Controls (Untreated Cases)

The end result varies between: (*a*) recovery without paralysis; (*b*) survival with mild paralysis; (*c*) survival with moderate paralysis; (*d*) survival with severe paralysis; and (*e*) death.

II. Treated Cases

(*A*) *The patient*: (1) age, (2) weight, (3) resistance, (4) duration of illness, and (5) the possibility of undetected paralysis when serum is given.

(*B*) *The virus*: variations in virulence, making, with *II-A*-3 (the patient's resistance) variations in the rate of progress of the disease.

(*C*) *The serum available*: (1) selection of donors; the possibility of inclusion of non-immunes; (2) time interval from donor's attack; (3) variation in potency in individual's sera, comparable to that of horses immunized against diphtheria; (4) possibility of immunity of donors being induced by a strain different from that of the patients; and (5) deterioration from storage, exposure to heat, and perhaps antiseptic.

(*D*) *The doctor*: (1) his judgment and experience in assessing dose; (2) method of administration chosen; (3) his detection of need for a second dose; (4) his assessment of size of second dose; (5) the time allowed to elapse between puncture and treatment of case; and (6) (together with *A*-5) his skill in muscle examination.

Some of these variables can be taken care of, by checking at every stage. Those under the heading *II-C* (the serum) have been discussed. Those under section I (prognosis of the untreated cases), and *II-A* (the virus) and *II-B* (the patients) cannot be standardized. The variables under the heading *II-D* (the doctor) are reduced when small series are handled; but they cannot be controlled when large epidemics occur, and the care of the patient is entrusted to a large personnel of variable experience. Statisticians tell us that in the presence of variables of such numbers, comparisons can be profitable only when data have accumulated of groups of cases of numbers large enough to take care of these variables—several thousand cases. The other approach to the problem is the attitude that in human immune serum a weapon is available for treating these cases; true, a weapon not very strong, unconcentrated, liable to variation in potency, unstandardized, yet the best we have at present. Can we, by vigilance, varying the tactics adopted to suit the conditions presented, by careful consideration of the failures, use this weapon to avert paralysis? It is suggested that the studies in Victoria, during six years in which exceptional opportunities for individual care of patients was presented, justify the statement that it can be done.

Summary

At present the only therapy available for use in acute poliomyelitis is human immune serum. Experimental work has shown that such serum can inactivate virus; that injection of non-immune serum into the theca may do

actual harm; that the dilution of immune serum lengthens the time interval required for the inactivation of the virus. In order to obtain serum of as high potency as possible, it is essential to confirm the diagnosis by clinical examination of donors for residual paralysis, unless each individual's serum can be shown to be potent by animal inoculation. It is probable that donors recently paralyzed furnish serum of higher potency than those with paralysis of longer duration, though variation of potency may occur in individuals. In testing specimens of pooled sera, it is suggested that the tests should be carried out against a virus isolated during a recent epidemic. After preparation, the serum should be guarded against deterioration from exposure to heat. It is suggested that delay between lumbar puncture and administration of serum should be avoided. Early in the preparalytic stage, the intramuscular injection of potent serum has been, in some hands, successful. Later, after the development of spine sign for some hours, tremor or hyperaesthesia, photophobia or retention, treatment by means of the intrathecal and intravenous method has been successful in Victoria. The estimation of the dose requires consideration of all the evidence obtainable, and varies within wide limits. Until we have some reliable method of standardization of the serum available, the only indication that the guess has approximated the requirements is the patient's response to the therapy. It is advantageous, therefore, that the serum be prepared by a method which produces a product free from irritants which will provoke a reaction. The method evolved by Morgan in Australia satisfies these requirements. If cases are to be called "preparalytic," examination of muscle function carried out before serum is administered should be as thorough as the later examination to determine the end result. In view of the number of variable factors which enter into the therapy, the administration of an arbitrarily fixed dose to all cases should not be regarded as adequate treatment. Unless the dose selected for all is as large as the maximum dose required by any patient, this procedure is bound to be followed by a proportion of failures. Because of the variations encountered, the care of a preparalytic case of poliomyelitis demands, on the part of the doctor, acumen and vigilance comparable to that required when treating a case of diabetic coma; and the results achieved depend as much upon his skill and experience with the serum he is using, as upon the potency of that product.

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The Value of Public Health Nursing as Practised During the Past Decade*

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Cattaraugus County Demonstration

THOSE who have followed the evolution of the so-called district nurse, through various stages, into the public health nurse, will probably have noted how closely this evolution has been identified with the advances in sanitation and in medical science which has brought about the modern public health movement. In varying capacities, nurses have been called upon to take an important part in the development of this movement and a new type of nursing service has gradually emerged.

One of the first trends of major importance to appear in this new type of nursing service was in the realization of the necessity for preparation of the nurse for the rapidly increasing demands made upon her. In the early days, little beyond the physical care of the patient was thought of, and for this a hospital training seemed sufficient preparation. It was the nurse herself, feeling her own inadequacies, who proved the necessity for something more. District homes in no way resemble hospital wards; they have a great variety, and the nurse's function in these homes gradually came to include many services besides bedside nursing. Her greatest problems were in the health of children, mental as well as physical; in mental hygiene with behaviour problems in adults as well as in children; in the teaching of expectant mothers; in the control of communicable disease, and so forth. She needed help in teaching nutrition as a factor of health rather than in disease; she needed to have an understanding of social case work in order to recognize and appreciate the significance of the many social problems involved in her work; she needed to know the methods of organization, so that her district might not suffer from experimentation; she needed help in her home service, in her case-guiding, and so on through a long list. The fact scarcely needs to be argued here that a hospital training, as now given, unsupplemented by additional post-graduate work, does not fit a nurse for public health nursing.

In the Weir *Survey of Nursing Education in Canada* we find the following minimum qualifications for the regular public health nurse:

1. Junior matriculation or its equivalent.
2. The completion of the three-year training course in an approved training school.
3. At least one year of successful experience in private duty or institutional nursing—preferably the former.
4. The completion of the one-year course in public health nursing offered by an approved university training school.
5. At least a six months' probation, under careful supervision, before acceptance on the regular staff.

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Or in lieu of 2, 3 and 4 above:

The completion of the four or five year course in public health nursing offered by Canadian or other recognized universities. The probationary period should be required of all candidates.

It is evident from the foregoing that public health nursing requires a high-grade personnel—women of intelligence, ability and sympathy who know what they are doing, having a knowledge of public health in general and of public health nursing in particular.

If for no other reason than that of economy, is this true—too large a proportion of the limited budgets for public health goes into nursing service to waste any of it on ineffective or amateurish work. It should be spent for expert service, and such service can be expected, with rare exceptions, only from the carefully chosen, well-trained nurse in public health.

Another significant trend in the development of public health nursing is its increasing integration with other health and welfare services. Public health nurses may function in special fields or as general health workers. At present there is a general tendency towards a decentralized, generalized service, which may or may not include bedside nursing. Whether doing specialized or generalized work, we believe that the particular and unique value of the nurse lies in her ability to carry health information into the homes of the people and to help individuals in these homes adapt themselves to habits of healthful living. The widening circle of activities in public health, ranging from laboratories of research and highly organized health practices, are sometimes far removed from the man in the street. He can be instructed in general principles of hygiene and health through pamphlets, lectures, the radio and the like, but something more is needed. Generalizations must be translated into terms of his own situation and needs.

Bedside nursing is one of the most effective teaching procedures we have and is one which no public health nurse can afford to discard. In general, the policy of providing bedside care when called for, but not stressing it as a major element in the programme, is essentially sound for public health nursing services. In those areas where no visiting nurse services are available, if the public health nurse does not include bedside nursing in her generalized service, there is a serious loss to the great value of a generalized district programme. Even in those districts where the Victorian Order of Nurses and other visiting nurse services are available and the public health nurses have less need for giving bedside care, there are still many opportunities for teaching by demonstration in the actual giving of nursing care. The nurse who uses these opportunities not only renders a needed service to her patients, but increases her value as a teacher of health in her district.

By virtue of their activities in health supervision in the homes as it relates to the different aspects of health, and the important part they play in relation to public health education, we find the services of the nurse entering the whole health programme. Obviously such a service is a co-operative undertaking. It should not be developed as an

isolated unit, but as a unit well integrated with the other health services, organized and developed under the leadership of the medical profession.

We find this integration of services coming about in the development of health departments in urban centres. In many of the smaller cities, towns and in rural areas, we still find scattered, isolated nursing units doing individual jobs for local authorities or unofficial agencies without supervision or correlation. The development of county health units is a forward step in bringing about this integration of services. The theory of partnership with the health officer in command, with the knowledge among the different workers of common, clearly defined objectives and the making of plans together for the best utilization of the respective services in gaining these objectives, is the ideal towards which we must continue to work.

The Development of Definite Methods of Procedure

All through these years of evolution, of learning by trial and error, certain methods of procedure have been formulating.

In most nursing organizations and departments of health, you will find prepared instructions in the methods of procedure for the many nursing services. The Victorian Order of Nurses has its manual. A Manual for Public Health Nurses has been prepared by the National Organization for Public Health Nursing in the United States. Materials for teaching have been assembled, lessons outlined, demonstrations of techniques prepared. We know what should be the procedure of the nurse in carrying out an effective programme in her tuberculosis work, for example,—what she should teach in the home, what she should do about contacts, how she can best assist the physician in clinics, and so forth. It is no longer necessary for her to wonder how she can work most effectively; her methods of procedure have been well tried and proved by experience and are ones she need not hesitate to follow.

In our other communicable disease programme, definite methods have been worked out. School nursing has a definite technique. Child welfare clinics and conferences are carried out along certain lines. Some of our other services are not so clearly defined, notably our work in maternal welfare, in mental hygiene, and in some of the social service aspects of our public health nursing.

At the meeting of the American Public Health Association in Montreal last September, one of the speakers emphasized the need of developing definite techniques in public health work. He spoke of the experience with the administration of toxin-antitoxin in the United States and gave as one of the reasons for the success of that work and for the ease with which it was put under way, the fact that health authorities had a definite objective and well designed procedures and techniques to employ in accomplishing their objective. The same is true in public health nursing, not only in developing procedures of nursing services, but those of supervision, of administration, of organization and of community relationships.

This may suggest to you a stereotyped form of nursing service. It does not necessarily imply such. Rather, it implies a uniformly higher standard of work brought about through wise leadership and far-sighted policies for growth and development. Those of us who are familiar with the experiences of the nurse working alone in isolated, rural districts can appreciate what definite methods of procedure mean to her. Given enough initiative ability to adapt them to the work in her particular community, she has a guide which will save her from many pitfalls and be of inestimable help in the many situations she, by reason of her isolation, must face and handle alone. Such nurses are many in number, and the number is likely to increase with the growth of public health. They need all the help we can give them.

Sometimes, in our zeal for theory, we are apt to forget that the putting into practice of that theory in the manner most likely to be effective is the real test of our true worth in public health work.

How are we going to evaluate this public health nursing service? How can it be picked out in its entirety from the other health services to be evaluated? We might consider, as an indication of its value, the fact that, as a rule, a rather high proportion of the budgets for public health go to nursing services; but this is not enough—important as it is, especially to the administrator. Another might be to take stock of what is being done. In health work we have come to think of this as appraising our value. When we have evolved certain standards of performance in relation to the needs of the community, it is relatively easy to appraise the quantity of service. It is not so easy to determine the quality. Appraisals and measuring rods vary so, and we are so apt to lack precision in our findings and conclusions, that often they can hardly be considered as true evaluations. Methods of procedure here are still in the process of developing.

Perhaps some indication of the value of public health nursing in Canada may be found in the following observations recorded in the Weir report. They are significant and meaningful, and, for our purpose, probably portray the true value of the nurse and her services as successfully as the more elaborate appraisal forms and measuring rods.

(1) "The public health nurse is recognized as an *essential* member of the public health forces of any community.

(2) "Her place in the modern health movement is accepted without question. In increasing degree does the public health nurse promise to become the leading exponent of the gospel of health-living in those communities which no longer regard the scourge of disease as a visitation of Divine Providence.

(3) "It is true that the various types of nursing services, whether educative and preventive or curative, rendered in the remote frontiers or in crowded city slums of Canada, differ in degree rather than in kind of usefulness. No patriot could ask for greater opportunity to serve his country than is given these young public health missionaries and teachers in rural and urban Canada."

The Mortality in Ontario of Four Communicable Diseases of Childhood*

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A LONG term survey of mortality rates is undertaken generally with the object of comparing the past and the present, or different periods in the years under review, with the possibility in mind of finding definite changes in the trend which might, by relating the change to various factors in the life of the people, give some indications for future control. Like all biological studies, such statistical information is notoriously susceptible to different interpretations and caution is necessary to avoid erroneous conclusions. Comparison of one disease with another may show that conclusions in regard to the behaviour of one disease, at first sight apparently justified, may not be valid. For instance, the general decline in diphtheria mortality in Ontario is generally attributed, and probably rightly so, to the introduction and subsequent extension of the use of diphtheria antitoxin. But that such a conclusion cannot be properly drawn from the trend alone is evident in the fact that the mortality rates for scarlet fever, for which there was no specific therapeutic agent till perhaps 1924, show a decline practically parallel with that of diphtheria. That does not mean that antitoxin has not been a definite factor in the decline of diphtheria, but it shows that the character of disease, in so far as it produces mortality, is in itself subject to change and that due cognizance must be taken of this fact before any conclusions are drawn from trends, or even from changes in trend. To measure the efficiency of control methods by trends may give the correct answer, but there are more reliable statistical tools for such work. Similarly, although the mortality rates from whooping cough and measles show no definite decline, we cannot say that the increasing efforts at control in the past thirty years have availed nothing. Just as scarlet fever has for unknown reasons shown a decline, whooping cough and measles might have, in the absence of the control measures applied, shown an increase. Other information than mortality data alone is necessary to conclude that complete failure has attended the efforts at control.

This comparison, however, teaches one of three things:

(1) That the latter two diseases have not been susceptible to the same factors in environment that may have influenced scarlet fever.
(2) That the organism causing scarlet fever has changed, or
(3) Most unlikely, that the reaction of the host to the causative

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TABLE I

MORTALITY—DIPHTHERIA, SCARLET FEVER, MEASLES AND WHOOPING COUGH

Ontario—1880-1929

	Diphtheria		Scarlet Fever		Measles		Whooping Cough	
Year	Deaths	Rate per 100,000	Deaths	Rate per 100,000	Deaths	Rate per 100,000	Deaths	Rate per 100,000
1880.....	1,251	66.0	409	21.6	265	14.0	297	15.7
1881.....	1,704	88.4	470	24.4	148	7.7	270	14.0
1882.....	1,708	87.8	543	27.9	75	3.9	183	9.4
1883.....	976	49.7	405	20.6	177	9.0	123	6.3
1884.....	929	46.8	382	19.3	81	4.1	154	7.8
1885.....	1,282	64.0	314	15.7	78	3.9	192	9.6
1886.....	1,833	90.7	260	12.9	149	7.4	205	10.1
1887.....	1,786	87.6	116	5.7	169	8.3	124	6.1
1888.....	1,459	70.9	132	6.4	128	6.2	187	9.1
1889.....	1,101	53.0	159	7.7	141	6.8	225	10.8
1890.....	893	42.6	151	7.2	186	8.9	190	9.1
1891.....	952	45.0	216	10.2	79	3.7	102	4.8
1892.....	890	41.9	240	11.3	117	5.5	145	6.8
1893.....	1,044	49.1	198	9.3	186	8.7	162	7.6
1894.....	1,075	50.3	454	21.3	206	9.6	178	8.3
1895.....	942	44.0	124	5.8	86	4.0	112	5.2
1896.....	925	43.1	99	4.6	36	1.7	187	8.7
1897.....	976	45.3	169	7.8	80	3.7	163	7.6
1898.....	634	29.3	222	10.3	115	5.3	126	5.8
1899.....	599	27.6	246	11.3	40	1.8	124	5.7
1900.....	738	33.9	170	7.8	143	6.6	185	8.5
1901.....	772	35.4	268	12.3	181	8.3	166	7.6
1902.....	676	30.5	346	15.6	143	6.4	204	9.2
1903.....	687	30.5	580	25.8	55	2.4	204	9.1
1904.....	608	26.6	163	7.1	30	1.3	109	4.8
1905.....	503	21.7	72	3.1	63	2.7	181	7.8
1906.....	423	18.0	64	2.7	128	5.4	240	10.2
1907.....	380	15.9	102	4.3	166	6.9	214	9.0
1908.....	450	18.6	163	6.7	38	1.6	246	10.1
1909.....	430	17.5	200	8.1	167	6.8	262	10.7
1910.....	435	17.5	237	9.5	304	12.2	186	7.5
1911.....	423	16.7	290	11.5	169	6.7	169	6.7
1912.....	371	14.4	152	5.9	111	4.3	419	16.3
1913.....	339	13.0	137	5.3	166	6.4	272	10.4
1914.....	443	16.7	111	4.2	61	2.3	196	7.4
1915.....	341	12.7	42	1.6	145	5.4	193	7.2
1916.....	461	16.9	49	1.8	411	15.1	341	12.5
1917.....	396	14.3	59	2.1	58	2.1	228	8.2
1918.....	335	11.9	84	3.0	95	3.4	303	10.8
1919.....	475	16.7	96	3.4	32	1.1	164	5.7
1920.....	745	25.7	170	5.9	303	10.5	376	13.0
1921.....	653	22.3	144	4.9	54	1.8	310	10.6
1922.....	411	13.8	136	4.6	67	2.2	200	6.7
1923.....	316	10.4	156	5.1	109	3.6	318	10.5
1924.....	322	10.5	159	5.2	180	5.9	147	4.8
1925.....	251	8.1	134	4.3	80	2.6	273	8.8
1926.....	227	7.2	81	2.6	156	4.9	245	7.8
1927.....	297	9.3	87	2.7	82	2.6	181	5.7
1928.....	213	6.6	67	2.1	62	1.9	175	5.4
1929.....	262	8.0	74	2.3	143	4.4	194	5.9

agent of scarlet fever has changed. In other words, the comparison indicates some fundamental difference in the epidemiology of the three diseases, a difference for which, at present, we lack an adequate explanation.

Differences in the epidemiology of these diseases are further revealed in an analysis of the distribution of deaths by age in different periods. The data for the four diseases for the years 1880-1884 and 1925-1929 are shown in Table II.

TABLE II

DIPHTHERIA, SCARLET FEVER, MEASLES AND WHOOPING COUGH
PERCENTAGE DISTRIBUTION OF DEATHS BY AGE
ONTARIO

	Diphtheria		Scarlet Fever	
Age	1880-1884	1925-1929	1880-1884	1925-1929
Under 1	12.9	4.2	10.1	3.8
1- 4	46.6	42.7	52.4	39.8
5- 9	25.5	36.9	25.0	26.9
10-14	8.5	8.8	5.0	8.3
15 and over	6.5	7.4	7.5	21.2

	Measles		Whooping Cough	
Age	1880-1884	1925-1929	1880-1884	1925-1929
Under 1	23.8	22.4	61.6	63.5
1- 4	47.2	51.0	33.6	32.0
5- 9	9.5	12.8	2.4	3.3
10-14	5.5	3.8	.9	.5
15 and over	14.0	10.0	1.5	.7

In diphtheria and scarlet fever, a shifting of deaths to higher age groups is evident. In the early period, the group under 1 provided 12.9 per cent of the diphtheria deaths, and the age group 0-4 provided 59.5 per cent. In the later period these percentages were 4.2 per cent and 46.9 per cent. This might be accounted for by a change in the age distribution of the population, but no comparable change has taken place in the population. That the early age groups have in reality suffered less from diphtheria in proportion to older age groups in recent years is corroborated by the age specific rates, as shown in Diagram III. Here it is evident that there has been a more marked decline in the younger age groups than in the others. Why? It is certainly not true that, in the period in review, any specific active immunization was more concentrated in the younger age groups. It is possible, though no definite data in this regard are available, that passive immunization in the case of contacts was more consistently carried out in the younger age groups. That suggestion is, however, a mere guess at present.

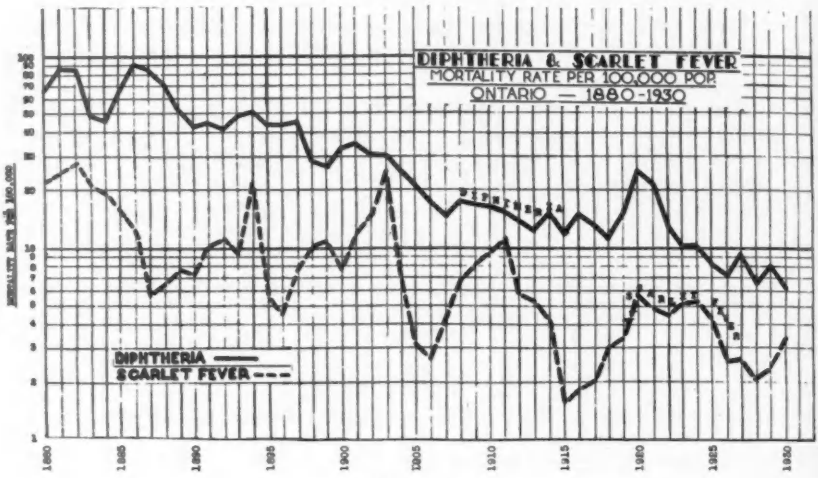

DIAGRAM I

Would the smaller families of to-day explain the difference? Possibly, but the fact that no such shifting in the age distribution or difference in the specific rates is evident in whooping cough makes one hesitant about accepting that explanation. Another guess as an explanation, as good as any other, is the fact or the impression that the younger child has received more attention than formerly and has been more shielded from possible sources of contamination. Of the true explanation, however, we are in ignorance.

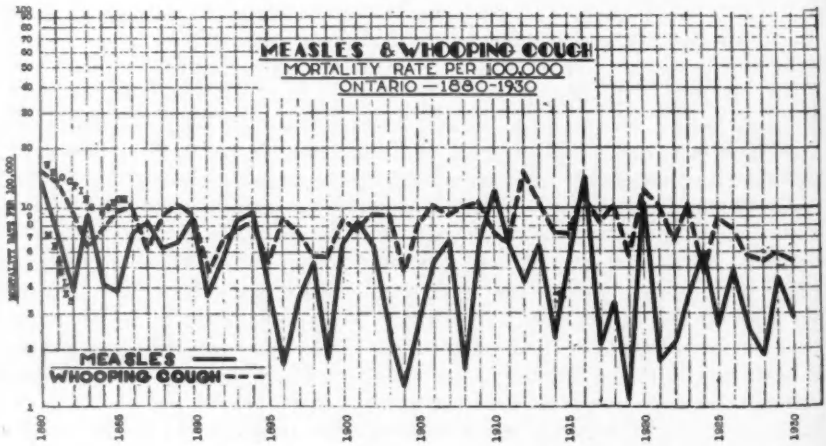

DIAGRAM II

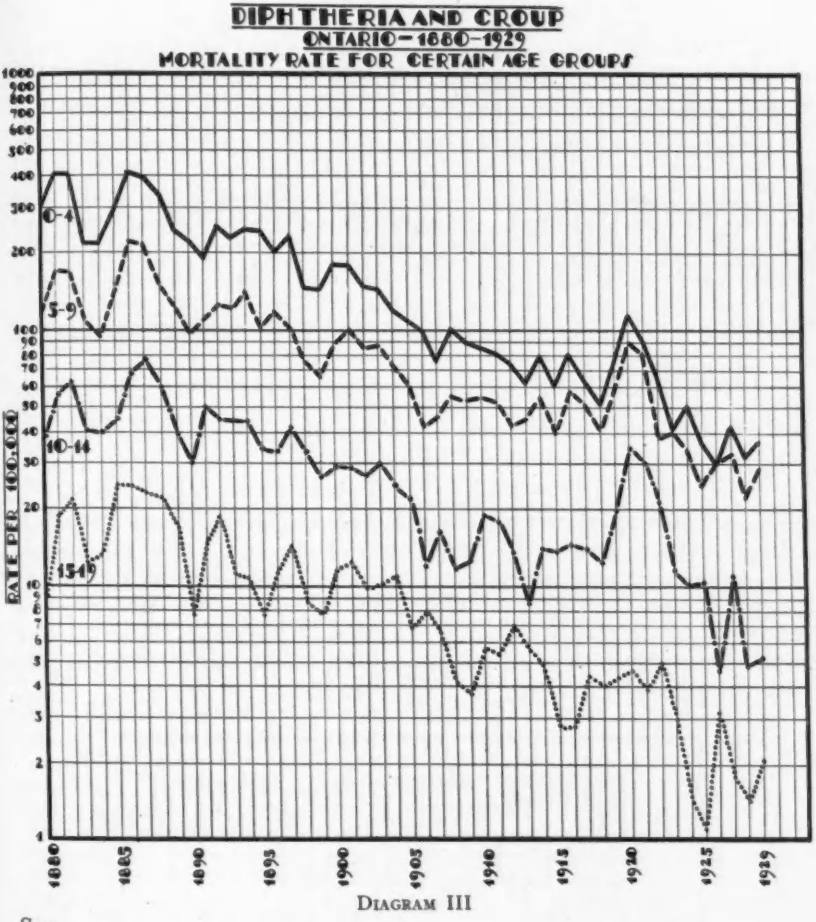

DIAGRAM III

Sex

Sex shows as a significant factor in the deaths from whooping cough. It is evident from Table III and Diagram IV that in practically every year the female mortality rates from whooping cough are greater than the male rates. These data too agree with the findings in other studies, both in Ontario and other places. No satisfactory explanation of this difference has yet been found. The other three diseases do not show any such consistent significant difference.

Rural and Urban

The rural and urban distribution shows differences between these four diseases. In diphtheria, the urban rate is significantly greater than the rural rate, but in measles and whooping cough there is no consistent

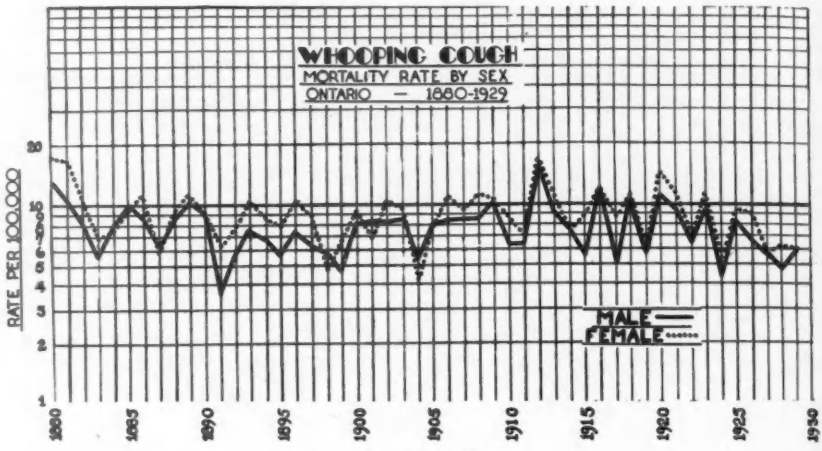

DIAGRAM IV

difference between rural and urban rates in the recent years. It would appear that the greater infective power of the latter two diseases has been sufficient to overcome the barriers of rural isolation to a much greater extent than that of diphtheria. This greater infectivity is reflected, too, in the greater concentration of the cases of measles and whooping cough in the younger age groups. This finding is in keeping with the general knowledge of these diseases.

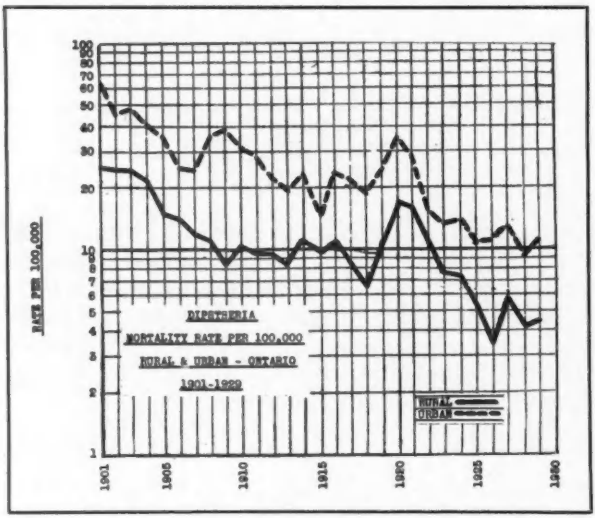

DIAGRAM Va

TABLE III

ONTARIO, 1880-1929

SEX SPECIFIC MORTALITY FOR FOUR COMMUNICABLE DISEASES

RATE PER 100,000

	Diphtheria		Scarlet Fever		Measles		Whooping Cough	
Year	Male	Female	Male	Female	Male	Female	Male	Female
1880	66	66	21.0	22.1	14.4	13.4	13.6	17.8
1881	89	88	23.9	24.9	7.2	8.2	11.0	17.1
1882	87	88	28.9	26.9	4.2	3.5	8.1	10.7
1883	51	48	20.6	20.7	8.9	9.1	5.6	6.9
1884	47	47	18.5	20.1	4.1	4.1	8.0	7.6
1885	69	59	15.7	15.7	3.2	4.7	9.9	9.2
1886	91	91	12.8	12.9	7.3	7.4	8.6	11.7
1887	89	86	4.8	6.5	8.5	8.1	6.3	5.9
1888	70	71	5.9	6.9	6.5	5.9	8.8	9.3
1889	55	51	8.4	6.9	7.0	6.5	10.2	11.5
1890	44	41	6.8	7.6	9.6	8.1	9.1	9.1
1891	47	43	10.9	10.4	3.3	3.4	3.7	6.2
1892	57	55	10.5	12.1	5.7	5.3	5.8	7.9
1893	46	52	17.4	16.9	4.7	5.5	7.5	10.6
1894	53	51	22.5	21.9	3.3	2.7	6.8	8.7
1895	42	45	15.0	17.9	2.9	3.0	5.7	8.0
1896	43	35	5.7	3.7	1.9	1.2	7.3	10.3
1897	45	45	8.2	7.5	3.4	4.0	6.2	8.9
1898	29	30	10.7	9.9	5.5	5.1	5.8	5.8
1899	30	26	12.5	10.2	1.7	1.9	4.7	6.8
1900	34	33	8.1	7.5	6.6	6.5	8.0	9.1
1901	35	35	11.9	12.7	8.8	7.8	8.3	6.9
1902	31	30	15.4	16.2	6.4	7.2	8.1	10.8
1903	31	30	25.2	26.3	2.5	2.4	8.5	9.6
1904	28	25	7.3	7.0	1.0	1.6	5.3	4.2
1905	22	21	3.4	2.8	2.5	3.0	8.0	7.6
1906	19	17	2.6	2.9	4.8	6.1	8.6	11.7
1907	14	18	3.4	5.1	6.3	7.6	8.5	9.4
1908	19	18	6.7	6.7	1.4	1.8	8.5	11.9
1909	17	18	9.1	7.1	7.6	6.0	10.0	11.3
1910	17	17	8.6	10.5	12.0	12.3	6.3	8.7
1911	18	17	10.7	12.2	6.1	7.3	6.4	7.0
1912	13	16	5.8	6.0	4.3	4.3	15.5	17.1
1913	13	13	5.3	5.2	6.6	6.1	9.3	11.6
1914	17	17	4.0	4.4	1.9	2.7	7.4	7.4
1915	13	13	1.4	1.6	4.9	5.9	5.6	8.9
1916	18	16	1.3	1.6	16.4	14.3	12.1	13.1
1917	15	13	2.8	1.8	1.9	2.1	8.0	8.8
1918	13	11	3.5	2.5	3.8	3.0	10.2	11.3
1919	18	15	3.3	3.3	1.2	1.0	5.8	5.7
1920	26	27	5.7	6.0	10.2	10.8	11.9	14.1
1921	22	23	4.5	5.3	1.9	1.8	9.4	11.8
1922	14	13	4.6	4.5	2.6	1.9	6.4	7.0
1923	9.7	11	5.3	4.9	3.2	4.1	9.6	11.4
1924	11.0	10	5.0	5.3	5.3	6.5	4.3	5.3
1925	8.3	7.8	4.2	4.4	2.4	2.8	8.1	9.5
1926	7.5	6.9	2.3	2.8	5.1	4.8	6.5	9.0
1927	9.9	8.7	2.7	2.7	3.3	1.8	5.7	5.7
1928	7.1	6.1	1.4	2.7	2.2	1.6	4.8	6.1
1929	8.1	7.9	2.5	2.0	4.1	4.6	5.9	6.0

TABLE IV

ONTARIO

	Diphtheria				Scarlet Fever				Measles				Whooping Cough			
	Urban		Rural		Urban		Rural		Urban		Rural		Urban		Rural	
Year	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
1901	351	61.8	421	26.2	126	22.1	142	8.8	48	8.5	133	8.3	50	8.8	116	7.2
1902	263	45.6	413	25.2	172	29.8	178	10.9	27	4.7	116	7.1	45	7.8	159	9.7
1903	280	48.6	407	24.4	181	31.4	399	23.8	13	2.3	42	2.5	81	14.0	123	7.3
1904	253	40.6	355	21.3	44	7.1	119	7.1	14	2.3	16	1.0	29	4.7	80	4.8
1905	229	36.0	274	16.3	23	3.6	49	2.9	27	4.2	36	2.1	51	8.0	130	7.7
1906	169	26.2	254	14.9	22	3.4	43	2.5	31	4.8	97	5.7	64	9.9	176	10.3
1907	165	24.6	215	12.5	69	10.2	33	1.9	64	9.5	102	6.0	102	15.2	112	6.5
1908	251	36.3	199	11.5	88	12.7	75	4.3	7	1.0	31	1.8	117	17.0	129	7.4
1909	280	39.2	150	8.6	122	17.1	78	4.5	101	14.2	66	3.8	97	13.6	165	9.5
1910	262	31.2	173	10.5	120	14.2	117	7.1	160	19.0	144	8.8	84	10.0	102	6.2
1911	274	29.0	149	9.5	159	16.6	131	8.3	83	8.8	86	5.5	95	10.0	74	4.7
1912	227	22.0	144	9.3	73	7.1	79	5.1	73	7.1	38	2.5	220	21.4	199	12.9
1913	216	19.4	123	8.2	83	7.5	54	3.6	113	10.2	53	3.5	107	9.6	165	11.0
1914	275	23.7	168	11.3	57	4.9	54	3.6	27	2.3	34	2.3	99	8.5	97	6.5
1915	192	16.7	149	9.7	29	2.5	11	0.7	113	9.9	32	2.1	81	7.1	112	7.3
1916	283	23.9	178	11.5	32	2.7	9	0.6	200	16.9	211	13.7	178	15.0	163	10.6
1917	265	22.0	131	8.3	42	3.5	22	1.4	35	2.9	23	1.5	90	7.5	138	8.8
1918	232	18.9	103	6.5	58	4.7	26	1.6	72	5.9	23	1.4	144	11.7	159	10.0
1919	303	24.1	172	10.8	58	4.6	36	2.3	19	1.5	13	.8	74	5.9	90	5.6
1920	470	35.6	275	17.5	110	8.3	60	3.8	186	14.1	117	7.5	210	15.9	166	10.5
1921	378	28.6	275	17.0	86	6.5	58	3.6	20	1.5	34	2.1	154	11.7	156	9.7
1922	228	16.9	183	11.2	80	5.9	56	3.4	48	3.5	19	1.2	59	4.4	141	8.7
1923	188	13.7	128	7.7	81	5.9	75	4.5	73	5.3	36	2.2	188	13.7	130	7.9
1924	200	14.3	122	7.3	81	5.8	78	4.7	74	5.3	106	6.3	66	4.7	81	4.9
1925	163	11.1	88	5.4	59	4.0	75	4.6	32	2.2	48	2.9	111	7.5	162	9.9
1926	171	11.3	56	3.4	39	2.6	42	2.6	92	6.1	64	3.9	95	6.3	150	9.2
1927	201	13.5	96	5.7	39	2.6	48	2.8	40	2.7	42	2.5	92	6.2	89	5.2
1928	144	9.3	69	4.1	31	2.0	36	2.1	32	2.1	30	1.8	102	6.6	73	4.3
1929	187	11.6	75	4.5	47	2.7	27	1.6	90	5.6	53	3.2	99	6.2	95	5.7

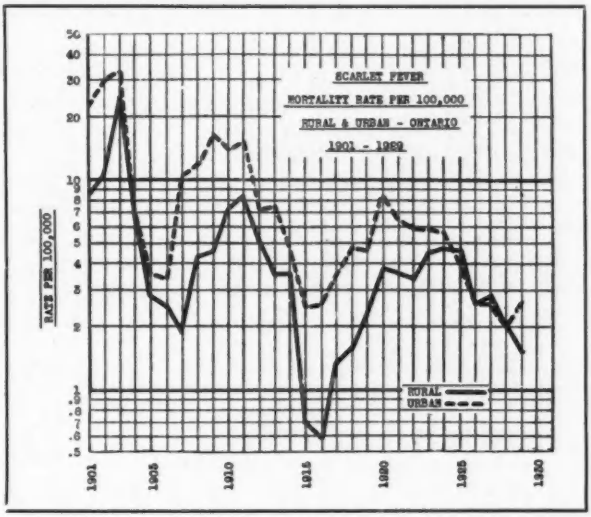

DIAGRAM VB

The Public Health Problems of To-day

Apart from such general comparisons and contrasts indicating differences at various periods in one disease or differences between the various diseases, the data serve to indicate the present day public health problems presented by these four communicable diseases of childhood. Together, in the early part of the period covered in the

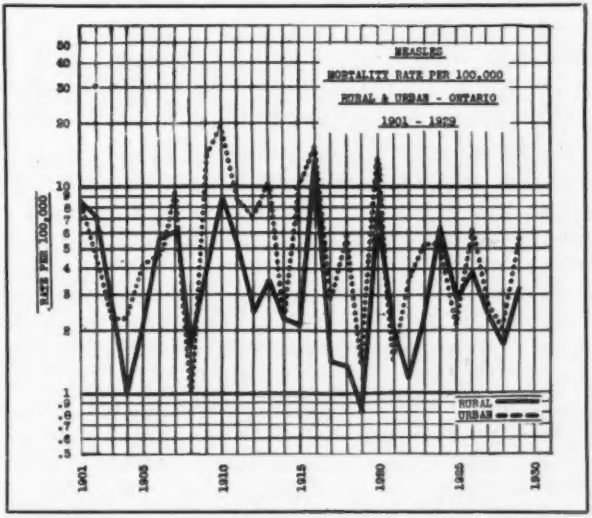

DIAGRAM VC

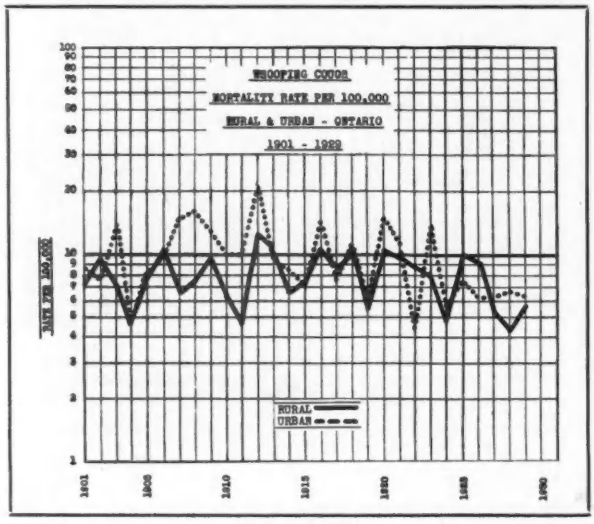

DIAGRAM VD

survey, they accounted for 35 per cent of all deaths in the age group of 1-14, or more than 1 in 3 of all deaths in that group. In spite of the great decline in the rates of diphtheria and scarlet fever, they still accounted for, in the latter part of the period, 1925-1929, 17 per cent of the deaths in this group, or over 1 in 6 of all the deaths. Including deaths at all ages, they still account for over 600 deaths annually in Ontario—and the number is contributed very largely by the group of children under 10 years of age. These figures alone indicate the extent of the public health problem to-day. A brief reference to certain specific age groups and the distribution of deaths by age indicate a clearer presentation of the public health problem of each of these diseases.

TABLE V

DIPHTHERIA, SCARLET FEVER, MEASLES AND WHOOPING COUGH
AS PROPORTION OF DEATHS FROM ALL CAUSES
AGES 1-14 YEARS—ONTARIO

	1880-1884		1925-1929	
	Number	Per cent	Number	Per cent
All causes	20,942		12,832	
Diphtheria	5,297	25.3	1,105	8.6
Scarlet Fever	1,157	5.5	332	2.6
Measles	463	2.2	354	2.8
Whooping Cough	379	1.8	382	3.0
Total	7,296	34.8	2,173	17.0

Table II shows the age distribution of the diphtheria deaths. It is evident that nearly 50 per cent occur in the first five years of life. That fact alone, so often repeated and necessary of repetition, indicates the necessity for the inclusion of the pre-school child in any plan for the control of diphtheria. That such control is urgently needed is shown by Table VI. Here it is evident that diphtheria accounted for more deaths of children 2-14 years of age in Ontario in the years 1925-1929 than any other disease.

While the menace of scarlet fever does not approach at present that of diphtheria, it is by no means insignificant. Ontario still loses annually 75-100 lives from scarlet fever. Nearly half of these, as shown in Table II, are in the young age groups, but a significant percentage, 21 per cent, occur in the older age groups of 15 and over.

TABLE VI

CHIEF CAUSES OF DEATH—ONTARIO, 1925-1929
AGE-GROUP 2 TO 14 YEARS

Causes	Deaths	
	Number	Per cent of all causes
External Causes	1,682	17.8
Diphtheria	997	10.5
Pneumonia and Bronchitis	836	8.9
Tuberculosis (all forms)	675	7.1
Appendicitis and Typhlitis	539	5.7
Influenza	477	5.1
All causes	9,444	

Measles, too often considered inconsequential as far as deaths are concerned, in reality is a very definite problem. The annual average loss from this disease is 104, a number greater than that from scarlet fever. And here the deaths are concentrated to a greater degree in the young child. In fact, 73.4 per cent of these deaths are in the first five years, 62.9 per cent in the first three years and 22.4 per cent in the first year. It is evident that the control of measles, in order to decrease the deaths, must entail the control of measles in the age group under 5 and especially in the first 2 or 3 years of life. This is not new, but the findings serve to emphasize the importance of consideration of the age group that suffers most, in the application of any control measures.

Whooping cough still takes its toll of lives annually in Ontario, and, like measles, shows no indication of any decline. Here again the deaths are still more concentrated in the infant and the one-year-old child. Sixty-three point five per cent and 22.7 per cent of whooping cough deaths occur in those respective age groups. Such a number from such a limited age group places whooping cough as a more serious public health problem in regard to the age group of 0-1 than any of the other diseases under review.

Editorials

THE ST. CATHARINES EPIDEMIC

WHAT has been said of milk-borne epidemics has been so often repeated that to sanitarians the mention of yet another epidemic either produces a feeling of profound ennui or calls forth a series of unprintable expletives carefully chosen to meet the exigencies of the situation. I imagine the two groups, those who have had the edge of their enthusiasm dulled and those of a more sanguine temperament, are numerically almost equally divided. The one group knows that next year, and for succeeding years, milk epidemics will occur, both recognized and missed. The other group is impressed with the heaven-sent opportunity of profiting by the calamitous experience.

One of the most striking features of the St. Catharines epidemic is the remarkable sequence of events which led to the single, sudden and widespread dissemination of B. paratyphosus B. The circumstantial evidence points to the contamination of the milk cans by a polluted stream in which these cans were placed for cooling during the extremely hot weather. A deluge of rain raised the water level. The laboratory had, on previous occasions, reported the presence of para B amongst residents of St. Catharines. Chronic carriers of this micro-organism are known to occur with the same sort of frequency as for B. typhosus. Whether the milk was contaminated in the more dramatic fashion, as suggested by the findings of the investigation, or by the more prosaic and more direct means of a chronic carrier, is not particularly significant. The contaminated milk was received at a newly constructed pasteurizing plant. The equipment and installation was found faulty in several essential particulars. However, the significant fact of the accidental release of milk from one of the vats before the milk had been heated, and in this way contaminating the rest of the equipment, is the basic and salient factor underlying the epidemic. The discovery of this strange denouement reflects great credit upon those whose duty it was to conduct the investigation.

Of the 457 recorded cases, 400 histories were analyzed. Twenty-four per cent fell into the 0-4 year group, and 57 per cent were under 15 years of age. It is surprising that there were no deaths in the younger age groups. The three patients who died were adults. In a recent epidemic of paratyphoid in Essex, England, seven deaths occurred among 257 cases.

It is difficult to imagine any intelligent person cognizant of the conditions under which commercial milk production is carried on being opposed to pasteurization. Nevertheless, there are such, and not everyone who drinks milk is intelligent. There is nothing better calculated to strengthen the hand of those opposed to pasteurization than this epidemic. A large dairy installs new equipment: the result, 3 deaths and 457 cases. The lesson is obvious. The time is long past when the responsibility for the installation of efficient pasteurization equipment and its adequate control is left to the manufacturer and to the dairy management, no matter how conscientious the latter may be. The Province of Ontario makes provision for the supervision of the construction of water purification and sewerage disposal plants. Debentures may not be issued by a municipality until the plans are approved by the Engineering Division of the Department of Health. A municipality has the power to legalize the pasteurization of its milk supply. Such a by-law lacks "teeth" unless a clause be added setting out in detail the specifications of construction and installation of the equipment and making provision for its intelligent operation and control. A large municipality in Ontario expends approximately five cents a head per year on milk production control, including dairy inspection within the city, and farm inspection. At this small outlay, efficient control has been maintained over a period of years.

In the House of Lords, Lord Moynihan, in support of pasteurization, stated that the nation lost 100 people every day of the year and spent £250,000 a day in the treatment of tuberculosis, a large proportion of which was preventable. As one walked about the streets, not so much in London as in provincial towns, one saw a large number of hunchbacks, people with warped joints, people with necks full of glands, scars on the neck from abscesses, and a large number of these people suffered from their diseases because of the drinking of contaminated milk. Milk was not only an agricultural problem; it was a human problem. Dr. Macnamara from Australia was astounded to find that there was no bovine tuberculosis in Toronto. That, and such epidemics as the one in St. Catharines, is the answer to the question of pasteurization—but only if it is efficiently carried out and adequately controlled.

D. T. Fraser.

PUBLIC HEALTH NURSING

RUBY M. SIMPSON, Reg.N., and MRS. GEORGE HANNA, Reg.N.

The Need for Publicity in Health Education

ANNA E. WELLS, Reg.N.

Director, Health Education Branch, Manitoba Department of Health and Public Welfare

ALTHOUGH we have all been brought up to avoid publicity, as health workers we are expected to reach the public and convince its individuals of the truth and value of modern ideas for the preservation of health. Hence the reason for considering publicity in relation to health education.

Health education may be defined as the act of instructing the public in matters relating to physical, mental and social health, in all age groups. *Publicity* has been defined as the act of making information public. "As a part of a movement to improve living conditions, its aim can be realized only as it succeeds in effecting changes in human thought and action."† Publicity in health education is making health information public. The purpose of health publicity is, in brief, to arouse an interest in and to interpret public health work, and to promote healthful living. Health publicity, is, therefore, educational. Likewise, health education gives rise to publicity; witness the health teaching in the school as a means of making health ideas known and appreciated in the home. Although it is difficult to draw a distinct line between them, a large health agency maintains that "not publicity, but health education for the prevention of disease and health is the objective of the Health Education Bureau." This health education is accomplished by a routine distribution of pamphlets, weekly articles to the press, a weekly health bulletin, radio talks and a speakers' bureau.

Publicity may be considered as the means or the tools for promoting and conducting health educational activities.

Why Publicity for Health Education?

The need of health education for all sections of society has been too well established to warrant discussion at this time; but how can we make the public realize this need?

In the industrial field, where success is measured by financial profits, advertising is a recognized essential. It is the Alpha and Omega of business life. "Not only is there an enormous economic and trade value from the activities of the advertiser, but also from the by-products of publicity," said the Hon. J. R. Clynes, in advising against the curtailment of expenses for advertising, because it seemed to be the easiest form of saving; "for such saving may turn out to be a loss."

Industrial advertising costs usually vary from five to twenty per cent of the total cost of production. Now, if "health is a business proposition," we may safely conclude that, like any successful business, health must be well and widely advertised. In other words, we must adopt successful publicity methods, and adapt them as a means of obtaining public good will and understanding.

**Presented at the 20th Annual Meeting, Canadian Public Health Association, Regina, June, 1931.*

†*"Publicity for Social Work"—M. S. and E. G. Routzahn.*

Manufacturers make use of the "health appeal" so successfully that the result justifies elaborate and expensive advertising campaigns. And we have reason to believe that public response to this appeal is due to the cumulative effect of the publicity given by health agencies, even though it may have been administered in minute doses. Furthermore, by studying the methods used in successful health demonstrations, we know how much the satisfactory outcome has depended upon the judicious use of publicity.

Generally speaking, publicity has been somewhat of a Cinderella in the realm of health in Canada. This has been so chiefly because of the unfavorable attitude of the professions towards advertising, their tardy recognition of publicity as one of the powerful forces in human affairs, and the consequent lack of public opinion and support necessary for its development. But sooner or later we must face the fact that, much as we may disapprove of publicity, public opinion is leavened with it, and upon public understanding and approval depends our progress in health educational activities.

Health Workers as Publicity Agents

Health authorities regard the nurse with a public health training as the best medium for broadcasting health information in the community. She should be, therefore, the most effective publicity agent.

Now if all health publicity is educational, and if health educational work is carried on by publicity methods of one kind or another, it seems reasonable to suggest that workers who specialize in making health information public should have a thorough knowledge of health educational requirements. Similarly, health workers or health educators should understand the value of publicity, and know how to use it effectively. This does not mean that the health worker who is supposed to know something about medicine, bacteriology, sanitation, sociology, economics, psychology and pedagogy, as well as nursing and home economics, should also be a journalist, an orator, a sign painter, carpenter and painter, et cetera, as occasion requires. If one is well versed in all these arts, so much the better. But such versatility is rarely found. In fact, in this age of specialization it is difficult for one who has to be a "jack-of-all-trades" to become proficient in each field. An effective health worker need not be more than a health encyclopedist, if he has cultivated the talents he has been blessed with and has sufficient administrative ability to make use of the talents of others to supplement his own.

The greatest difficulty to be overcome, individually and as a group, is over-modesty. This, coupled with a certain disregard of the dramatic value in the everyday routine of work, is very likely a cause of the "dry as dust" reports that may mean much but teach very little. Often a piece of work by a public health work nurse would have been front page news if a reporter had got hold of it in time. In one community you may find a nurse so worn and worried by multitudinous demands that she has little time or energy left to talk about public health work or to interest others in helping her. In another community you may find a nurse who works less hard but talks a lot about her work and plans, resulting in more actual service by others in the community. Which of the two acomplishes more in the end, if such publicity has encouraged public interest and support? *Precept and Practice.*

The next difficulty is the failure to realize that publicity, like charity, begins at home. Many of us are so busy "selling health" to others that little time is left to practise what we preach in matters of healthful living; and yet exemplifying what we preach is the most important approach to health publicity. How often the offices of health agencies are housed where there is inadequate ventilation and sunlight. Does this mean that health

workers give little thought to their own requirements as workers and educators; or that they are unable to convince the "powers that be" of their needs in this respect? In either case, we must remember that unfavorable publicity is sure to follow when there is any discrepancy between precept and practice. Have you ever listened to an excellent health lecture in a soporific atmosphere, or attended a health or educational convention where the sessions went on and on without intermission in which to stretch? At a recent convention, careful arrangements were made in this regard. During the morning and afternoon, a fifteen-minute intermission gave members an opportunity to visit the exhibit hall (so often left to the last day when displays are being packed), from which they were recalled for the next session by a warning bell.

Avenues for Health Publicity

We are told that "there is no royal road to health publicity—the field is new, and the health educator has few precedents on which to base his efforts." But of this we can be certain, that the preventive and protective health measures of to-day have become known largely by the same methods used from time immemorial to bring new ideas to the notice of the people—by talking, by making pictures and by writing.

What might be a publicity programme for the public health nurse? First, the community should be made conscious of her presence, and the purpose of her service. Having accomplished this by means of personal visits of introduction to officials and to church community leaders, and through announcements in the local newspapers, the school, and church and community organizations, she must arrange a follow-up system in order to maintain interest and support. Consequently, it is wise for her to become a member of an organization that is representative of the district and to arrange for lines of communication with teachers, editors of newspapers and their correspondents, and all others who can assist in health educational work.

A plan should be prepared for routine publicity throughout the year. Even if a plan cannot be fully carried out, it will chart the way and help to keep the goal in view. This plan, of course, must be based upon the health and social needs of each community as determined by the health officer, and have his sanction, bearing in mind the problems that should receive immediate attention—*e.g.*, diphtheria immunization—and those less pressing which may be given attention later. If a health worker does this consciously and conscientiously, utilizing with judgment every opportunity for publicity, without appearing always to be thinking and talking about health work, the easier will be the task of health education.

So much for a community programme. The need for publicity measures in a provincial health department varies according to the aptitude and efforts of the field health workers in developing publicity measures. No matter how qualified these health workers may be, there are always the difficulties of insufficient time and lack of library facilities for preparing material, of keeping informed on all branches of health work, and of obtaining publicity materials to supplement verbal instruction. The provincial agency is a central bureau of information to keep workers in touch with new ideas in health education, to provide publicity materials, to encourage workers to focus attention on one health problem at a time, so that, by working together, more may be accomplished by concentration of effort, as in a dental-health campaign. Having a bird's-eye view of the health field as a whole, it is possible for such an agency to co-ordinate publicity measures, to help workers initiate new projects from time to time, and to maintain a fairly uniform standard of health educational work. In addition, it may prevent duplication of effort by

acting as a medium for the publicity materials prepared by our national health organizations, upon whom we rely for inspiration and direction concerning the work undertaken by each.

General Difficulties in Developing Publicity.

The trend in health education and its effect upon publicity is a matter that every health worker should observe, so that she may be ready to guide, instead of being only an opportunist. For instance, years ago we all started Little Mothers' Leagues for school girls as a publicity and educational measure for infant welfare work. The idea caught, and grew. We then added home nursing and first aid instruction to that of infant care, because we saw the need of such training. Coupled with health habit training, it gave the teaching of hygiene in the school the practical work that was necessary to vitalize such teaching. At first it was an extra-curricular activity. However, year by year, constant effort has shown the need of first aid lessons in school as a means of promoting safety first measures. And now one teacher is so enthused about this work that he says he would not teach physiology and hygiene without tying it up to first aid. This raises the question, then, whether it is better to leave instruction regarding the care of the body in emergency until the pupil knows how to care for his body in health, or to link such instruction with the teaching of physiology and hygiene. A question of education, of course, but one that involves publicity, too, as to the wisdom of spreading the idea.

Our work is constantly leading us into new experiences that are often difficult and discouraging. Methods are continually changing. For this reason we need some way in which those specializing in health publicity and education can get together and work out their problem. A trouble shared is a trouble halved; so runs an old proverb. "In unity there is strength," and, I might add, wisdom, because in this way we would make greater progress.

For the most part, health workers are unable, through pressure of routine, to put into effect new ideas that require time and funds to develop. For this reason we need a national health agency to set up standards for publicity and educational methods, and to study the aspects of these fields still to be developed. Such an agency would be a clearing house for health publicity materials, and a centre for information about health educational work in Canada.

REPORTED CASES OF CERTAIN COMMUNICABLE DISEASES IN CANADA* BY PROVINCES—MAY, 1932.

Diseases	P.E.I.	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Diphtheria	2	8	4	82	86	28	13	1	4
Scarlet Fever	2	40	32	306	274	68	12	10	11
Measles	—	8	55	632	5835	512	52	85	261
Whooping Cough	—	13	12	124	464	102	97	1	95
German Measles	—	—	—	35	75	†	3	1	10
Mumps	—	30	—	180	1096	80	22	20	91
Smallpox	—	—	—	—	24	—	13	—	—
Cerebrospinal Meningitis	—	—	—	4	5	1	—	—	2
Anterior Poliomyelitis	—	—	—	—	—	—	—	—	—
Typhoid Fever	—	—	2	116	19	7	6	2	3
Trachoma	—	—	—	—	—	41	—	—	—

*Data furnished by the Dominion Bureau of Statistics, Ottawa.
†Not reportable.

NEWS AND COMMENTS

P. A. T. SNEATH, M.D., D.P.H.

THE first Institute on Health Education to be conducted by the Public Health Education Section of the American Public Health Association will be held at the Hotel Willard, Washington, D.C., October 22, 23, and 24, immediately preceding the Annual Meeting of the Association, which opens on Monday, October 24. Active health education workers in official departments of health and in voluntary agencies are invited to enroll.

British Columbia

THE principals of two Vancouver schools are working with a committee of nurses to evolve a nurses' course for the high school curriculum. An effort was made to obtain a summer course at the University of British Columbia, but conditions made it impossible for the University to grant this, although it will endeavor to help nurses in the field obtain their certificates by attendance at sessions.

Alberta

A LOAN FUND for unemployed nurses in Alberta has been sponsored by the Edmonton Graduate Nurses' Association. Nurses in permanent positions have subscribed to this fund, which is safeguarded by a committee which grants loans to nurses needing financial assistance because of economic conditions.

At a recent meeting, the College of Physicians and Surgeons of Alberta passed a resolution urging the Federal government to take steps to prevent the deposits of radium recently found in northern Alberta from falling into the hands of a foreign monopoly, citing reports that foreign commercial interests are now making efforts to obtain control of the Canadian pitchblende deposits.

Saskatchewan

REPRESENTATIONS have been made to the Minister of Public Health, requesting that only registered nurses be allowed to hold hospital positions in the province and recommending the discontinuance of training schools in hospitals having fewer than seventy-five beds.

Manitoba

DR. NOEL R. RAWSON, who has just completed a Post Graduate course in Public Health at the School of Hygiene, University of Toronto, has joined the staff of the Department of Health and Public Welfare as Acting Epidemiologist.

Cardston has launched a co-operative scheme between the two medical practitioners of the town and families of the community, whereby a charge of $25 a year will create a community fund from which the doctors will be paid. More than $3,600 has already been collected and further families are subscribing. The scheme proposes regular medical examinations in an effort to "keep the community well."

The Manitoba Medical Association will hold its annual meeting in Winnipeg on September 8th, 9th and 10th. The list of visiting speakers will include Dr. W. E. Gallie and Dr. W. B. Hendry of the University of Toronto, Dr. F. R. Miller and Dr. Geo. C. Hale of the Western University Medical School, London, and Dr. W. A. Fansler of the University of Minnesota.

Ontario

MISS FLORENCE H. M. EMORY, Assistant Director of the Department of Public Health Nursing, University of Toronto, was re-elected by acclamation as President of the Canadian Nurses' Association at their biennial convention in Saint John, N.B., on June 21st.

The American Association for the Study of Goitre met in Hamilton on June 14, 15, and 16. Dr. C. H. Mayo, Rochester, Minn., Dr. L. F. Barker, Baltimore, and Dr. G. W. Crile, Cleveland, were among those attending from the United States.

Discoveries of importance concern-

ing the fundamental nature of cancer tissue, the result of five years' research work in the laboratories of the University of Western Ontario, are to be reported to the Cancer Institute of London (England), by Dr. Fred J. H. Campbell, of the Institute of Public Health, London. Dr. Campbell and his associate, Dr. E. Percival Johns, chief of the Department of Bacteriology and Pathology of the Institute, have been at work on the problem for several years and expect to publish their findings in the fall.

Miss Nora Moore, of the Department of Public Health, Toronto, was re-elected Honorary Secretary of the Canadian Nurses' Association at the convention in Saint John during the last week in June.

Marked progress in the field of mental nursing in Ontario is reported following the establishment of an undergraduate course in mental hygiene and psychiatric nursing at the Toronto Psychiatric Hospital and a post graduate course in mental nursing at the Ontario Hospital, Whitby.

Matters affecting public health, the medical profession and its science, were discussed at the 63rd annual meeting of the Canadian Medical Association, held in conjunction with the 52nd annual meeting of the Ontario Medical Association in the Royal York Hotel, Toronto, from June 20th to 24th, inclusive. Dr. G. A. B. Addy of Saint John was chosen president-elect and 1932 officers elected as follows: President, Dr. A. Primrose, Toronto; Honorary Treasurer, Dr. F. S. Patch, Montreal; Chairman of the Council, Dr. A. T. Bazin, Montreal; and General Secretary, Dr. T. C. Routley, Toronto.

The Ontario Medical Association announced the following officers as named by the nominating committee: President, Dr. J. H. Holbrook, Hamilton; First Vice-President, Dr. F. C. Neal, Peterboro; Second Vice-President, Dr. A. J. McGarrity, Kitchener; Honorary Treasurer, Dr. G. Stewart Cameron, Peterboro; and Secretary, Dr. T. C. Routley, Toronto.

Recommendations to relieve hospitals and physicians of heavy and unfair burdens incurred in the care of indigent patients were endorsed by the Ontario Medical Association at its annual meeting. Public or non-paying patients in general hospitals should be a complete charge upon public funds, it was urged, and medical care now given gratuitously to public patients should be paid for. The Association's stand in this matter was based upon the report of the Royal Commission.

A nursing matriculation course has been proposed as a standard requirement for entrance to schools for nurses in Ontario. Approval to introduce the course into high and vocational schools next September will be sought from the Senate of the University of Toronto and the Ministers of Health and Education.

On August 8th, Toronto will welcome the first Empire Dental Convention at the joint sessions of the British, Canadian and Ontario Dental Associations, which will convene at the Royal York Hotel, August 8th to 12th. Delegates are expected from Canada, Newfoundland, Great Britain, New Zealand, Australia and other parts of the Empire. There will also be an official delegation from the United States. A feature of the convention will be two series of clinics, one to be given in the Hotel and the other at the University of Toronto.

Dr. Jean Macnamara, Honorary Physician to the Children's Hospital of Melbourne, Australia, and Medical Officer of Poliomyelitis for the State of Victoria, was a recent visitor to Toronto. Dr. Macnamara, who was recently granted a fellowship by the Rockefeller Foundation for the study of poliomyelitis, spent the past six months in England and Europe, and is proceeding to Boston, where she will work with Dr. Aycock at the Harvard Medical School.

New Brunswick

THE Canadian Medical Association plans to hold its 64th annual convention in Saint John in 1933, in conjunction with the 22nd annual meeting of the Canadian Public Health Association.

The Canadian Nurses' Association held its biennial convention in Saint John from June 21st to 25th, inclusive, at which discussions on numerous phases of nursing were held and recommendations on the Weir *Survey Report of Nursing Education* considered. One of the outstanding addresses was that of the Hon. Vincent Massey, who stated that the nursing situation in Canada ranked second to unemployment as a national problem, pointing out that only three out of eight people in Canada are so ill as to require the care of a trained nurse could afford to engage one, while two-fifths of the trained nurses were unemployed, and nine-tenths of the trained nursing services were geographically within reach of less than half the population.

Dr. G. A. B. Addy, of Saint John, was chosen President-Elect of the Canadian Medical Association at the recent meeting in Toronto.

The Hon. Dr. H. I. Taylor, Minister of Health of New Brunswick, will be Honorary President of the Canadian Public Health Association during 1933.

The Saint John Infirmary will, the governing body announces, shortly undergo a change of name, to be known thereafter as Saint John's Hospital.

Nova Scotia

A HOUSING BILL, sponsored by the Hon. George H. Murphy, M.D., Minister of Health, and designed to stimulate the building of sanitary low-priced dwellings, was passed at the last session of the Legislature. A Housing Commission will be appointed, to serve without fees, to study the situation throughout the province and to outline remedial measures for localities in which conditions are detrimental to the public health.

Dr. John Stewart, for many years dean of the Faculty of Medicine of Dalhousie University, Halifax, has resigned at the age of eighty-four. He will be succeeded by Dr. Harry G. Grant, another Dalhousie graduate, who at the same time succeeds the late Dr. William Harop Hattie as Professor of Public Health.

Books and Reports

D. T. FRASER, B.A., M.B., D.P.H.; R. R. MCCLENAHAN, B.A., M.B., D.P.H.

Medicine and the State: *The Relation between the Private and Official Practice of Medicine, with Special Reference to Public Health. By Sir Arthur Newsholme, K.C.B., M.D., F.R.C.P., with a foreword by William H. Welch, M.D., LL.D. Publisher, The Williams & Wilkins Company, Baltimore,* 1932. 300 *pages. Price,* $3.50.

This is the fourth and concluding volume of *International Studies on the Practice of Medicine as Related to the Prevention of Disease,* summarizing the subject and giving a study of the underlying problems in the practice of preventive and clinical medicine, with suggestions for progress. The enquiry was made for the Millbank Memorial Fund of New York. In the course of this investigation, information was obtained from some seventeen European countries. As Dr. William H. Welch has stated in a

foreword to the present volume, a main purpose has been the collection and presentation of facts and conditions with a view to their utilization in efforts and proposals looking to the unification, combination and co-ordination of all the varied medical services for the greatest benefit to the community.

It is a great pleasure to read the book, not only for the vast fund of information not otherwise accessible, but for the vigorous and epigrammatic style of Sir Arthur Newsholme. The substance of this book will serve as an authoritative basis for any discussion upon the subject of medicine and the state and the many allied problems which present themselves for solution.

D. T. F.

The Heart Rate. *By Ernst P. Boas, M.D., and Ernst F. Goldschmidt, Ph.D. Publisher, Charles C. Thomas, 300 East Monroe Street, Springfield, Illinois,* 1932. 166 *pages. Price,* $3.50, *postpaid.*

This small book contains 144 charts and 148 tables illustrating the studies of the heart rate in health and disease of 356 individuals. The observations were made with Boas' cardiotachometer. The principle of this cardiotachometer consists in the use of the amplified action current of the heart to signalize each heart beat. The action current is led off by two electrodes placed on the precordium at points giving the maximum potential difference. A Macalpine amplifier and Loomis rate recorder have been used. Readings of the counter are taken at any desired interval.

In this way the heart rates of these subjects have been determined while pursuing a great variety of daily activities. Heart rates are given for 51 normal men and 52 normal women between the ages of 20 and 40 years during continuous periods of 12 to 24 hours. This gives one an insight into the effects on the heart rate of moderate to severe exercise. The various activities studied include sleeping, waking, lying, sitting, standing, walking, reading, working, talking, smoking, card playing, dancing, morning toilet, defecation, micturition, and sexual intercourse.

A long section is devoted to a consideration of the heart rate during sleep. Tables are given showing the maximum, minimum, basal, and average heart rates. The sexual differences and relationship of heart rate to body size, shape and position of the heart, blood pressure and menstruation.

The clinical section includes the heart rate during anaesthesia and 77 operations. The heart rates in cardiac insufficiency, valvular disease, myocarditis, Graves' disease and many other conditions are reported.

The authors are to be congratulated on the extent of their experiments which have covered a good part of the day and night in each case. The book is well written and well indexed. It should be of interest to both students of physiology and psychology, as well as to the practitioner who wishes to know the effect of these various daily activities on the heart rates of his patients.

R. R. McC.

CURRENT HEALTH LITERATURE

These brief abstracts are intended to direct attention to some articles in various journals which have been published during the preceding month. The Secretary of the Editorial Board is pleased to mail any of the journals referred to so that the abstracted article may be read in its entirety. No charge is made for this service. Prompt return (within three days) is requested in order that the journals may be available to other readers.

Vitamin B—The amount of vitamin B in a commercial preparation of bran was determined quantitatively, using oats, and a comparison made with raw bran. 0.6 gram of the prepared bran fed daily, along with a vitamin B—free basal diet, resulted in practically unit growth. The prepared bran had a vitamin B content only slightly less than whole wheat and slightly less than half that of raw bran. One ounce of whole wheat bread will furnish 62 vitamin units, and 100 calories, while one ounce of the prepared bran furnished 45 vitamin B units, with 30 calories. "Without adding very greatly then to the total calories in the adult diet, bran may contribute appreciably to the vitamin B content."

Rose, Mary S.; Vahlteich, Ella McC.; Funnell, Esther H.; and MacLeod, Grace, J. Am. Dietet. A., Vol. VII, No. 3 (March), pp. 369-374.

Economic Loss to New York State and the United States on Account of Mental Disease — The economic loss is estimated under two heads: (a) cost of maintenance of patients in hospitals, and (b) loss of earnings due to disability. The grand total arrived at is $742,145,956 in the United States in the year ended June 30, 1931.

Pollock, Horatio M., Ment. Hyg., Vol. XVI, No. 2, (April) pp. 289-299.

The Control of an Outbreak of Scarlet Fever—During a period of high incidence of scarlet fever in Chicago, an outbreak of the disease occurred in an infant and maternity hospital. It was found possible to stop the outbreak without closing the hospital. The measures employed comprised the taking of cultures; the masking of adult haemolytic streptococcus carriers, and the isolation of infants with positive throat cultures; the passive immunization of Dick positive contacts and the active immunization of all Dick positive patients.

Blatt, Maurice L., and Dale, Maurice L., J. A. M. A., Vol. 98, No. 17 (April 23), pp. 1437-39.

Trend of Smallpox Incidence in Civilized Countries—An unparalleled reduction in the incidence of smallpox has occurred in most European countries since 1920. In 1929 and 1930 no cases were reported in Austria, Belgium, Denmark, Norway, etc., while only two cases each were reported in Germany and Italy. Countries where vaccination is not in fact compulsory show a striking comparison. In 1930, 11,839 cases were reported in England, while 46,712 cases were reported in the United States.

U. S. P. H. Reports, Vol. 47, No. 15 (April 8), pp. 837-8.

The Occasional Elusiveness of the Tubercle Bacillus in Gross Lung Lesions—Instructive notes on five cases stress once more the importance of repeated examination of the sputum, by microscopical and cultural examination and, particularly, animal inoculation, before excluding the possibility of the lesion being tuberculous.

Cumming, W. M., and Foster, W. M., Tubercle, Vol. XIII, No. 7 (April), pp. 289-92.